

---

**THE COMMONS AT NOROTON HEIGHTS**  
**ADDENDUM TO THE ENGINEERING REPORT**

**Prepared For**

Federal Realty Investment Trust  
Noroton Heights  
Darien, CT

**Prepared by**

Redniss & Mead, Inc.  
22 First Street  
Stamford, CT  
(203) 327-0500

**Issued on:**  
July 18, 2017

**Issued for:**  
Site Plan Approval

  
Craig J. Flaherty, P.E.  
CT Lic. No. 21149

---

**REDNISS  
& MEAD**

LAND SURVEYING  
CIVIL ENGINEERING  
PLANNING & ZONING CONSULTING  
PERMITTING

22 First Street  
Stamford, CT 06905  
203.327.0500  
www.rednissmead.com



---

## West Avenue Inlet Capacity Analysis

July 17, 2017

The stormwater collection and conveyance system in West Avenue is designed to improve existing conditions. The layout incorporates multiple redundancies to ensure the system functions even when partially clogged. Three double catch basins with curb openings are provided on both sides of the road and an 11-foot wide overflow weir is incorporated into Junction Vault #4. Together, these inlets can pass twice the amount of surface flow that reaches West Avenue during a 100-year event. The double catch basins are connected to the proposed 6' x 5' box culvert by three separate conduits. Additionally, the structures are interconnected to allow for bypass.

### Hydraulic Models

Three separate HydroCAD models evaluate the functionality of the design:

1. Existing Conditions
2. Proposed Conditions
3. 50% Clogged Proposed Conditions (F.O.S. = 2)

### Model 1: Existing Conditions

The existing collection and conveyance systems throughout the watershed north of West Avenue are not sized to accommodate flows during large storm events. The surplus water not captured by the existing infrastructure drains overland to West Avenue. Starting in the 5-year storm water flows over the centerline of West Avenue and into the subject property. See Table 1 for a summary of the peak water surface elevations in existing conditions.

### Model 2: Proposed Conditions

Stormwater runoff is prevented from flowing overland into the subject property. Six double catch basins and the 11-foot wide overflow weir at Junction Vault #4 are added to capture overland flow. The 6-foot wide curb openings on each of the double catch basins are not factored into the design, making for a conservative analysis. Starting in the 10-year storm water flows over the centerline of West Avenue. The depth of water in all storms studied is lower than the existing condition. See Table 1 for a summary of the peak water surface elevations in proposed conditions.

### Model 3: Proposed Conditions - 50% Clogged, Factor of Safety = 2.0

In addition to ignoring flow through the curb openings, this model assumes half of each catch basin and half of the overflow weir are clogged. This model is provided to prove that even in a failure scenario the system is sufficiently redundant to capture the anticipated flows. With half of the system clogged, conditions are improved in all storms up to the 50-year event, complying with section 883 of the regulations. See Table 1 for a summary of the peak water surface elevations in the clogged condition.

Pipe Conveyance Analysis

A StormCAD model that analyzes the conveyance capacity of the proposed pipe network is provided. This model demonstrates the pipes are adequately sized to convey the 100-year flows without surcharging the system.

<b>TABLE 1: West Avenue Peak Water Surface Elevation</b>						
Existing vs. Proposed Conditions						
Storm	Existing <sup>1</sup>		Proposed <sup>2</sup>		Proposed 50% Clogged <sup>3</sup> (F.O.S. = 2)	
	Elev.	Height over Centerline	Elev.	Height over Centerline	Elev.	Height over Centerline
1	82.26	-1.9"	82.04	-4.6"	82.16	-3.1"
2	82.32	-1.2"	82.06	-4.3"	82.19	-2.8"
5	82.65	2.8"	82.33	-1.1"	82.51	1.1"
10	82.79	4.4"	82.53	1.3"	82.67	3.0"
25	82.90	5.8"	82.66	2.9"	82.80	4.6"
50	82.99	6.8"	82.77	4.2"	82.92	6.0"
100	83.08	7.9"	82.87	5.4"	83.31	10.7"

Note: The minimum centerline elevation of 82.42 is used to determine the depth over centerline

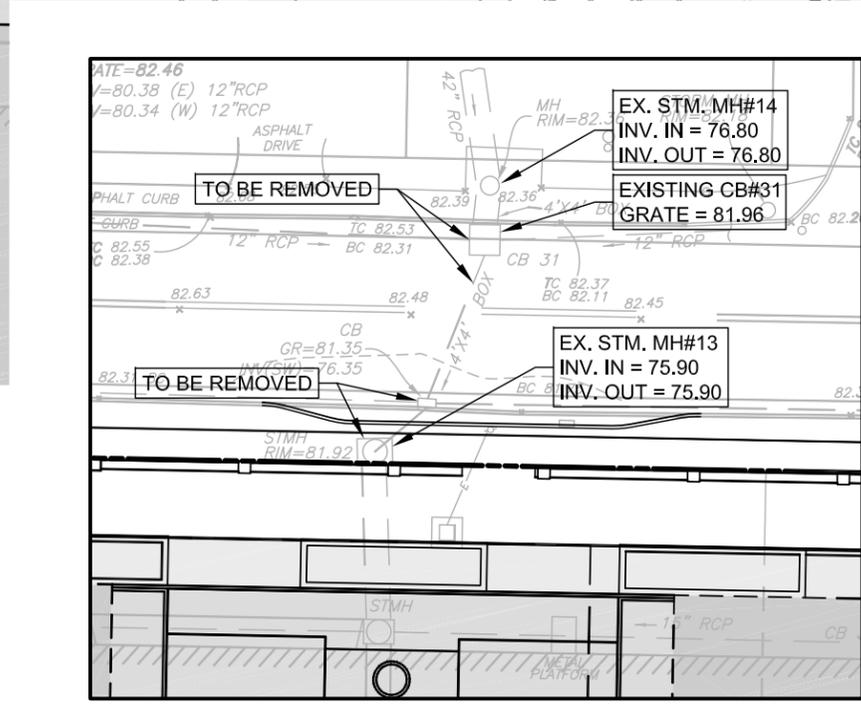
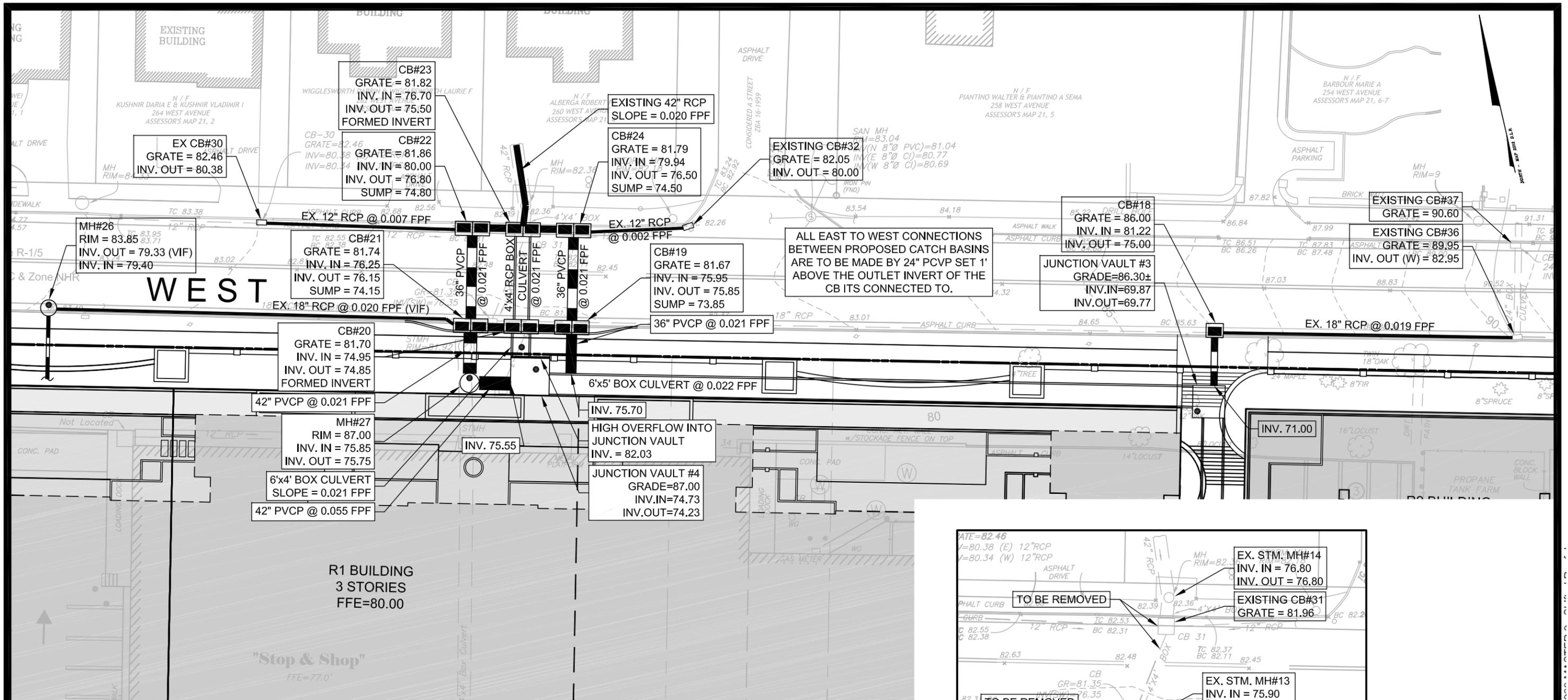
<sup>1</sup>The existing scenario models the northern lane of West Ave as the primary pond with the centerline operating as an asymmetric weir. Elevations taken from Pond 164P: Existing West Ave. Ponding.

<sup>2</sup>The proposed model uses the CT DOT method for calculating the capacity of grate inlet capacities. The curb opening's inlet capacity is not included. It functions as a bypass should the grate start to clog. Elevations taken from Pond: 178P: West Ave. - No Clog.

<sup>3</sup>The proposed model was altered to calculate the peak water surface elevation with the catch basin inlets and the high overflow weir partially clogged and operating at half capacity. (Factor of Safety for Clogging = 2). Elevations taken from Pond 177P: West Ave. - 50% Clog.

**Provided Documents:**

1. Plan of West Avenue Storm System
2. Sections of West Avenue Storm System
3. Summary of West Avenue Storm System Flows
4. West Avenue Drainage Basin Map
5. Exhibit of Storage and Weir Data
6. Catch Basin Inlet Capacity Calculations
7. HydroCAD Report
8. StormCAD Report including hydraulic profiles of each pipe section
9. FlowMaster Report for CB #18
10. Type "C" Catch Basin Double Grate Detail

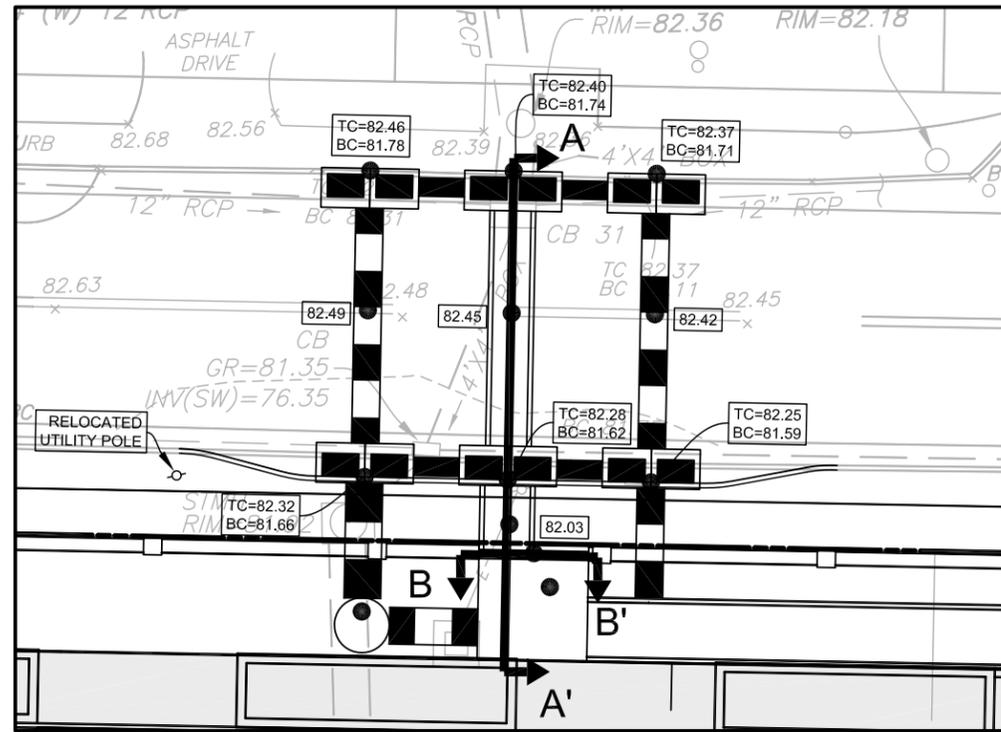


**REDNISS & MEAD**

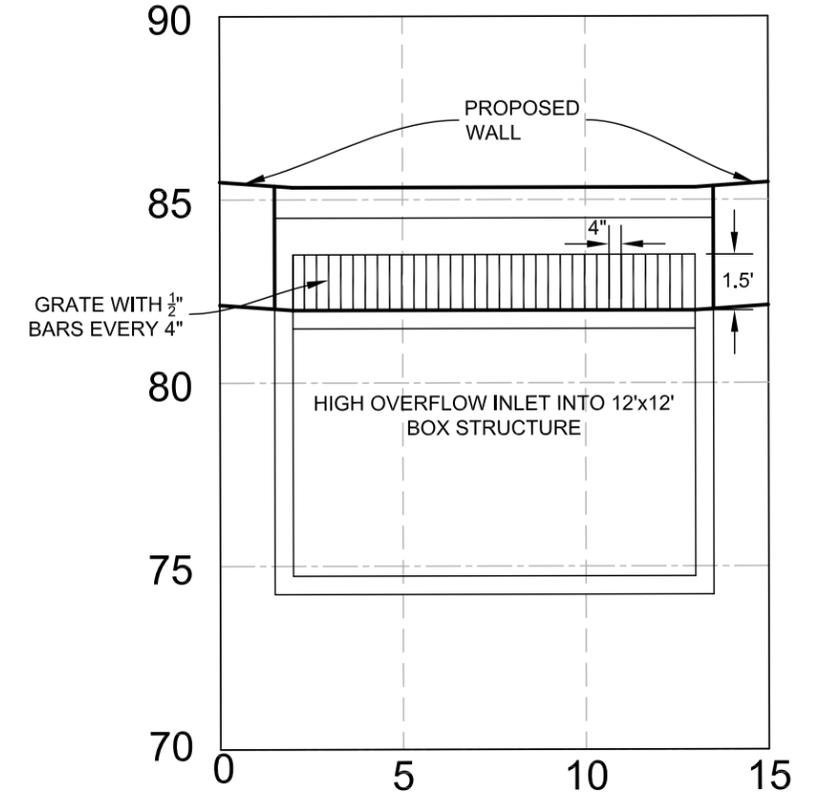
LAND SURVEYING  
CIVIL ENGINEERING  
PLANNING & ZONING CONSULTING  
PERMITTING

22 First Street | Stamford, CT 06905  
Tel: 203.327.0500 | Fax: 203.357.1118  
www.rednissmead.com

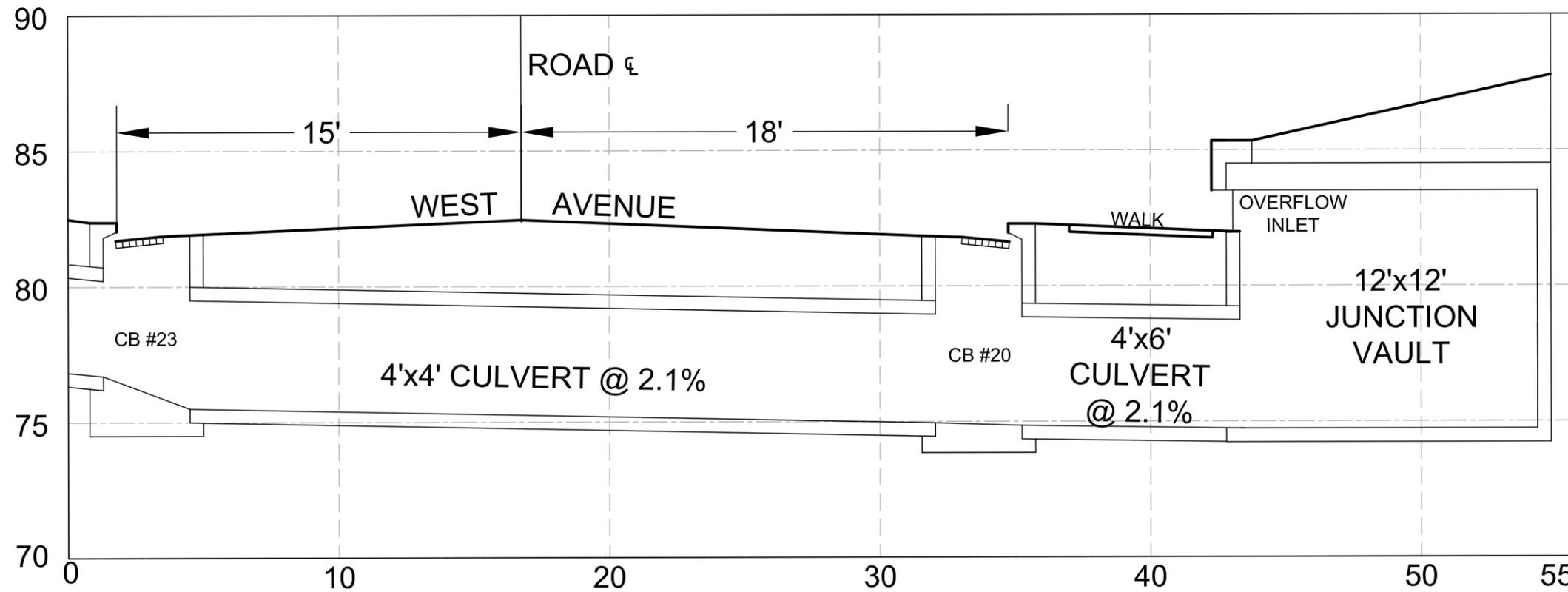
COMM. NO.: 7933	DATE: 07/17/2017 SCALE: 1" = 30'
--------------------	---



SECTION LOCATION  
SCALE: 1"=20'



SECTION B-B'  
HORIZONTAL SCALE: 1"=5'  
VERTICAL SCALE: 1"=5'

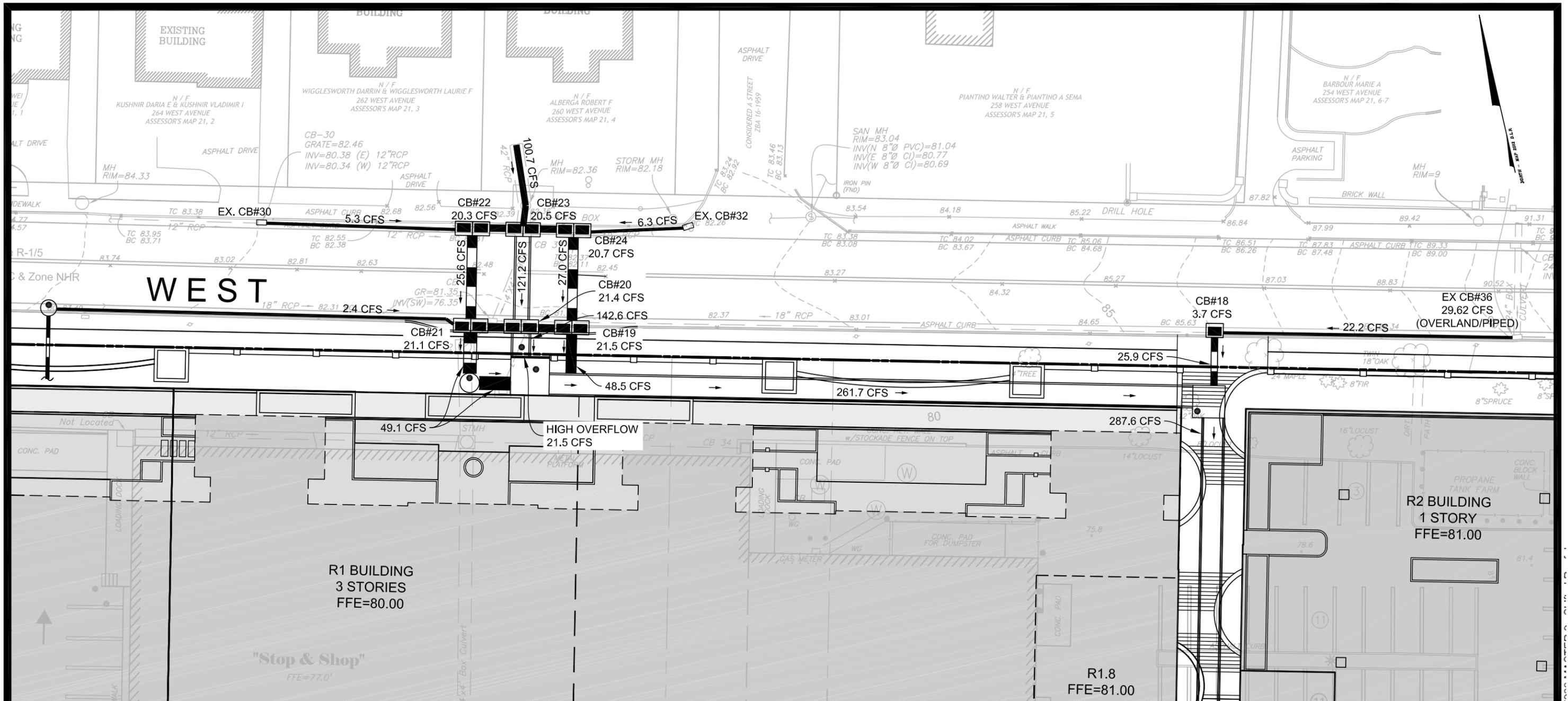


SECTION A-A'  
HORIZONTAL SCALE: 1"=5'  
VERTICAL SCALE: 1"=5'

**SECTIONS OF  
WEST AVENUE  
STORM SYSTEM  
THE COMMONS AT  
NOROTON HEIGHTS  
DARIEN, CT**

**REDNISS & MEAD**  
 LAND SURVEYING  
 CIVIL ENGINEERING  
 PLANNING & ZONING CONSULTING  
 PERMITTING  
 22 First Street | Stamford, CT 06905  
 Tel: 203.327.0500 | Fax: 203.357.1118  
 www.rednissmead.com

COMM. NO.: 7933	DATE: 07/17/2017
SCALE: 1" = 10'	



**WEST AVENUE STORM SYSTEM FLOWS  
THE COMMONS AT NOROTON HEIGHTS  
DARIEN, CT**

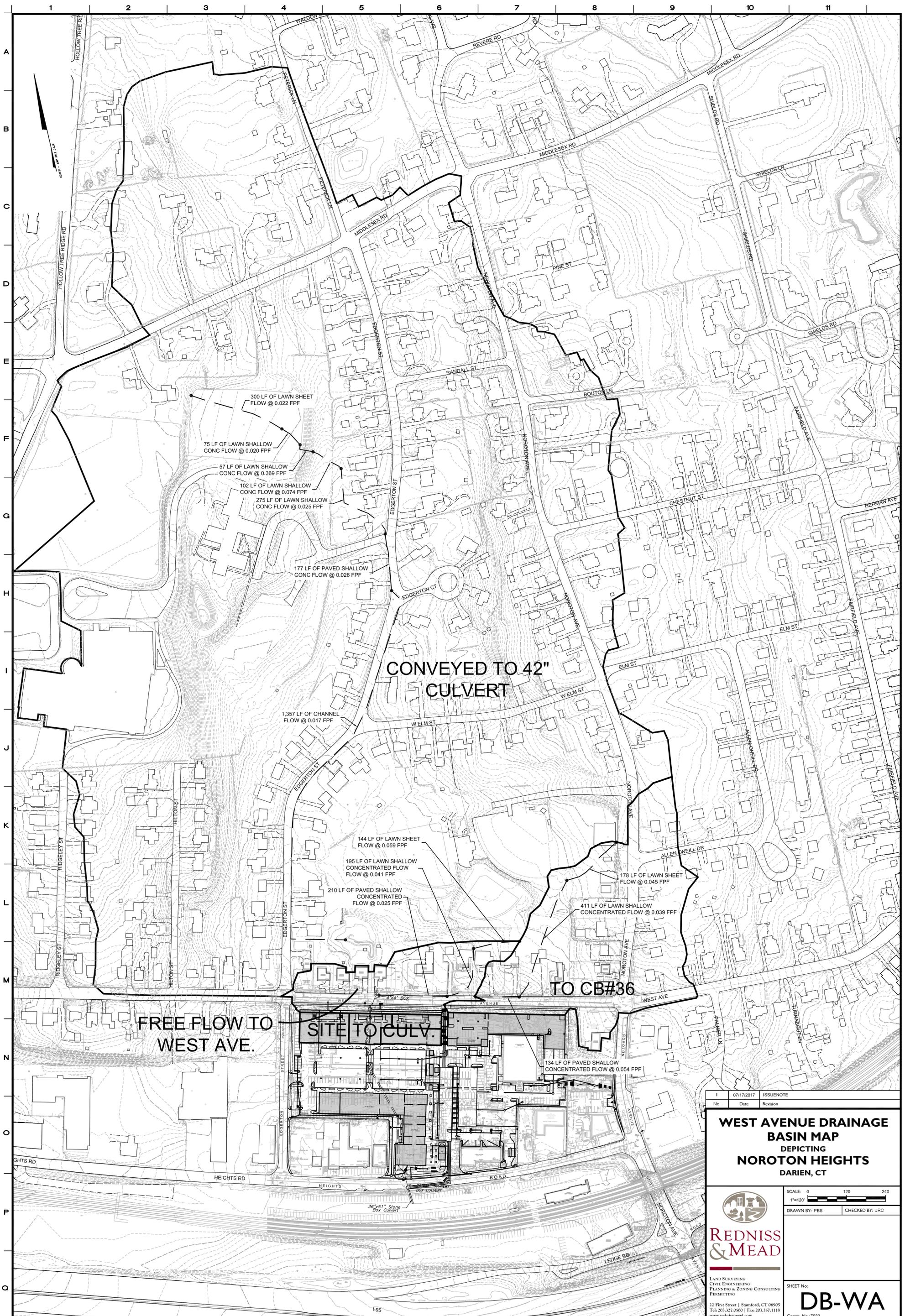


**REDNISS  
& MEAD**

LAND SURVEYING  
CIVIL ENGINEERING  
PLANNING & ZONING CONSULTING  
PERMITTING

22 First Street | Stamford, CT 06905  
Tel: 203.327.0500 | Fax: 203.357.1118  
www.rednissmead.com

COMM. NO.: 7933	DATE: 07/17/2017 SCALE: 1" = 30'
--------------------	---



No.	Date	Revision
1	07/17/2017	ISSUENOTE

**WEST AVENUE DRAINAGE  
BASIN MAP  
DEPICTING  
NOROTON HEIGHTS  
DARIEN, CT**

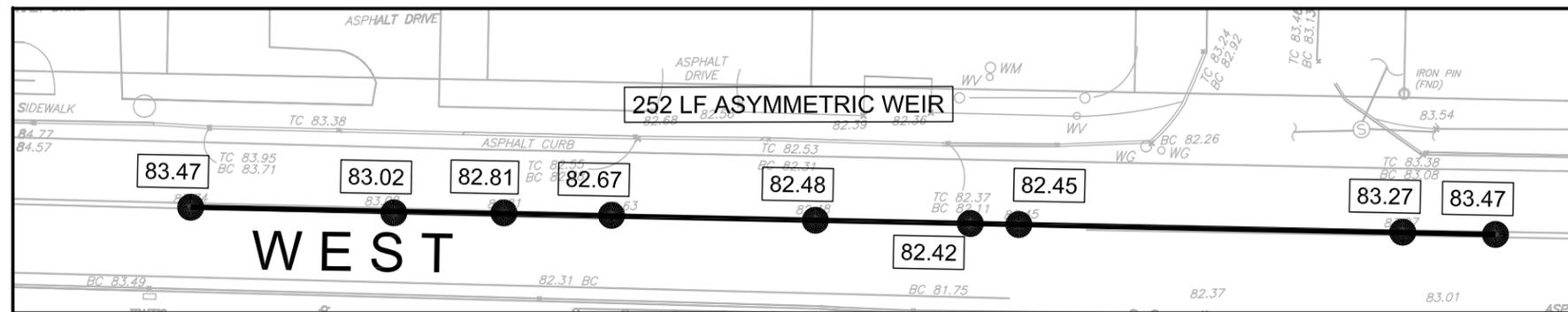
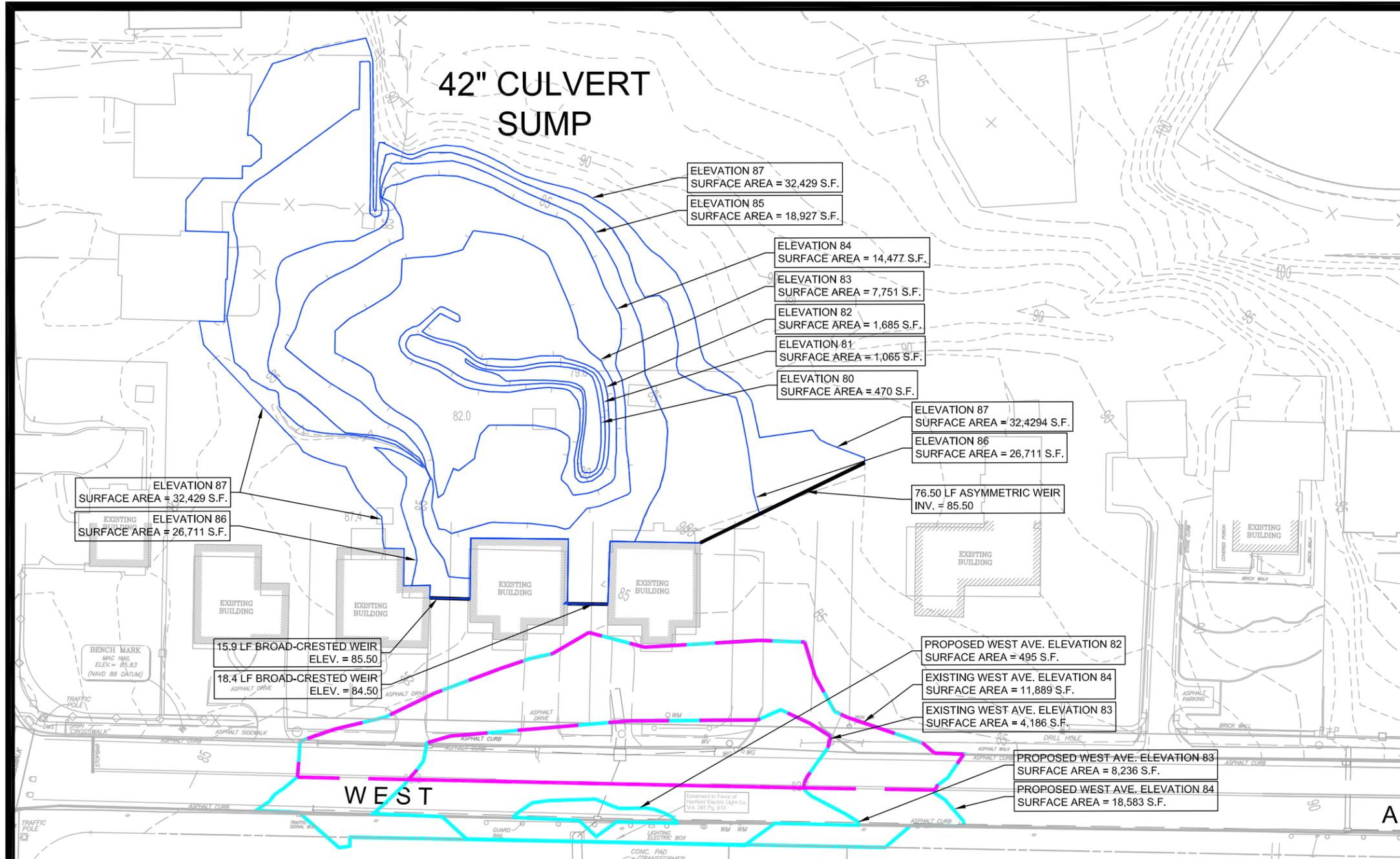
SCALE: 0 120 240  
1"=120'  
DRAWN BY: PBS CHECKED BY: JRC



LAND SURVEYING  
CIVIL ENGINEERING  
PLANNING & ZONING CONSULTING  
PERMITTING

SHEET No:  
**DB-WA**  
Comm. No: 7993

22 First Street | Stamford, CT 06905  
Tel: 203.327.0900 | Fax: 203.357.1118  
www.rednissmead.com



**WEST AVENUE ASYMMETRIC WEIR**

SCALE: 1" = 30'

**EXHIBIT OF STORAGE  
AND WEIR DATA  
NOROTON HEIGHTS  
DARIEN, CT**

**REDNISS  
& MEAD**

LAND SURVEYING  
CIVIL ENGINEERING  
PLANNING & ZONING CONSULTING  
PERMITTING

22 First Street | Stamford, CT 06905  
Tel: 203.327.0500 | Fax: 203.357.1118  
www.rednissmead.com

COMM. NO.: 7933	DATE: 07/17/2017
	SCALE: 1" = 50'

### CT DOT Catch Basin Inlet Capacity Calculations

Catch Basin Type	CT DOT Type "C" Double
Perimeter	7.33
Area	6.26
Weir Coefficient	3
Orifice Coefficient	0.67
Factor of Safety for Clogging	1
Acceleration due to Gravity	32.2

Depth Above Grate	Grate Capacity (Weir)	Grate Capacity (Orifice)	Transitional Flow
0.1	0.7		
0.2	2.0		
0.3	3.6		
0.4	5.6	21.3	5.6
0.5	7.8	23.8	9.4
0.6	10.2	26.1	13.4
0.7	12.9	28.2	17.5
0.8	15.7	30.1	21.5
0.9	18.8	31.9	25.4
1	22.0	33.7	29.0
1.1	25.4	35.3	32.3
1.2	28.9	36.9	35.3
1.3	32.6	38.4	37.8
1.4	36.4	39.8	39.8
1.5		41.2	
1.6		42.6	
1.7		43.9	
1.8		45.2	
1.9		46.4	
2		47.6	

Catch Basin Type	CT DOT Type "C" Double
Perimeter	7.33
Area	6.26
Weir Coefficient	3
Orifice Coefficient	0.67
Factor of Safety for Clogging	2
Acceleration due to Gravity	32.2

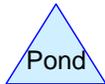
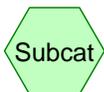
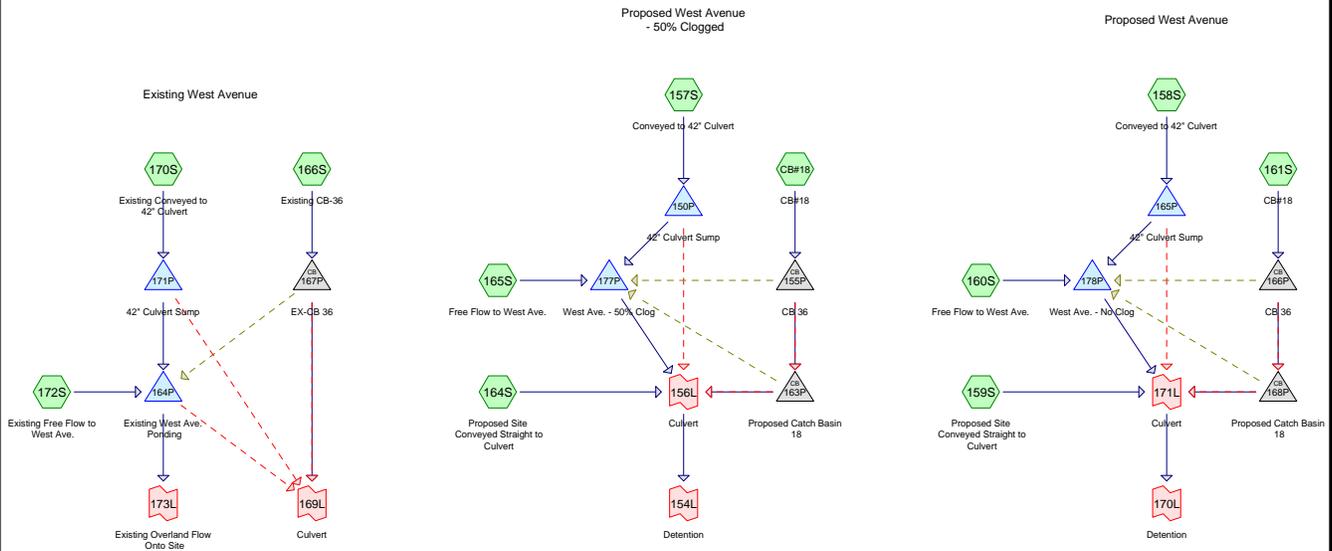
Depth Above Grate	Grate Capacity (Weir)	Grate Capacity (Orifice)	Transitional Flow
0.1	0.3		
0.2	1.0		
0.3	1.8		
0.4	2.8	10.6	2.8
0.5	3.9	11.9	4.7
0.6	5.1	13.0	6.7
0.7	6.4	14.1	8.7
0.8	7.9	15.1	10.7
0.9	9.4	16.0	12.7
1	11.0	16.8	14.5
1.1	12.7	17.7	16.2
1.2	14.5	18.4	17.6
1.3	16.3	19.2	18.9
1.4	18.2	19.9	19.9
1.5		20.6	
1.6		21.3	
1.7		21.9	
1.8		22.6	
1.9		23.2	
2		23.8	

Catch Basin Type	CT DOT Type "C-L"
Perimeter	7.33
Area	3.13
Weir Coefficient	3
Orifice Coefficient	0.67
Factor of Safety for Clogging	2
Acceleration due to Gravity	32.2

Depth Above Grate	Grate Capacity (Weir)	Grate Capacity (Orifice)	Transitional Flow
0.1	0.3		
0.2	1.0		
0.3	1.8		
0.4	2.8		
0.5	3.9	6.0	4.1
0.6	5.1	6.5	5.4
0.7	6.4	7.0	6.6
0.8	7.9	7.5	7.7
0.9	9.4	8.0	8.7
1	11.0	8.4	9.4
1.1	12.7	8.8	10.0
1.2	14.5	9.2	10.3

Weir Flow Occurs when depths are below .4' while orifice occurs when depths are greater than 1.4'. The transitional flow was calculated as a linear interpolation between the two flows based on the depth relative to the flow thresholds.

$Q_i = \frac{CPd^{1.5}}{C_{FS}} \text{ (Grate Capacity Weir)}$ <p>Equation 11.7 in ConnDOT Drainage Manual</p>
$Q_i = \frac{CA(2gd)^5}{C_{FS}} \text{ (Grate Capacity Orifice)}$ <p>Equation 11.8 in ConnDOT Drainage Manual</p>



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>1.01"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=52.07 cfs 333,481 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>1.01"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=52.07 cfs 333,481 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>2.12"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=1.58 cfs 7,259 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>1.40"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=3.08 cfs 12,320 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>1.32"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=7.37 cfs 32,947 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>2.12"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=1.58 cfs 7,259 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>1.40"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=3.08 cfs 12,320 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>1.32"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=7.37 cfs 32,947 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>1.01"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=52.07 cfs 333,481 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>1.48"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=2.94 cfs 11,750 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>1.32"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=7.37 cfs 32,947 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=82.68' Storage=4,749 cf Inflow=52.07 cfs 333,481 cf  
 Primary=0.00 cfs 0 cf Secondary=51.25 cfs 333,323 cf Outflow=51.25 cfs 333,323 cf

**Pond 155P: CB 36** Peak Elev=84.45' Inflow=7.37 cfs 32,947 cf  
 Primary=7.37 cfs 32,947 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=7.37 cfs 32,947 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=76.60' Inflow=7.37 cfs 32,947 cf  
 Primary=3.66 cfs 3,943 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 29,004 cf Outflow=7.37 cfs 32,947 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=82.26' Storage=183 cf Inflow=2.94 cfs 11,750 cf  
 Primary=0.00 cfs 0 cf Secondary=2.91 cfs 11,749 cf Outflow=2.91 cfs 11,749 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=82.68' Storage=4,749 cf Inflow=52.07 cfs 333,481 cf  
 Primary=0.00 cfs 0 cf Secondary=51.25 cfs 333,323 cf Outflow=51.25 cfs 333,323 cf

**7933 HydroCAD (TP40)**

Prepared by Microsoft

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Type III 24-hr 1-Year Rainfall=2.70"

Printed 7/18/2017

Page 3

**Pond 166P: CB 36** Peak Elev=84.45' Inflow=7.37 cfs 32,947 cf  
Primary=7.37 cfs 32,947 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=7.37 cfs 32,947 cf

**Pond 167P: EX-CB 36** Peak Elev=84.45' Inflow=7.37 cfs 32,947 cf  
Primary=7.37 cfs 32,947 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=7.37 cfs 32,947 cf

**Pond 168P: Proposed Catch Basin 18** Peak Elev=76.60' Inflow=7.37 cfs 32,947 cf  
Primary=3.66 cfs 3,943 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 29,004 cf Outflow=7.37 cfs 32,947 cf

**Pond 171P: 42" Culvert Sump** Peak Elev=82.68' Storage=4,749 cf Inflow=52.07 cfs 333,481 cf  
Primary=0.00 cfs 0 cf Secondary=51.25 cfs 333,335 cf Outflow=51.25 cfs 333,335 cf

**Pond 177P: West Ave. - 50% Clog** Peak Elev=82.16' Storage=334 cf Inflow=6.79 cfs 41,324 cf  
Outflow=6.77 cfs 41,234 cf

**Pond 178P: West Ave. - No Clog** Peak Elev=82.04' Storage=186 cf Inflow=6.79 cfs 41,324 cf  
Outflow=6.79 cfs 41,241 cf

**Link 154L: Detention** Inflow=56.53 cfs 385,759 cf  
Primary=56.53 cfs 385,759 cf

**Link 156L: Culvert** Inflow=56.53 cfs 385,759 cf  
Primary=56.53 cfs 385,759 cf

**Link 169L: Culvert** Inflow=55.74 cfs 378,031 cf  
Primary=55.74 cfs 378,031 cf

**Link 170L: Detention** Inflow=56.47 cfs 385,766 cf  
Primary=56.47 cfs 385,766 cf

**Link 171L: Culvert** Inflow=56.47 cfs 385,766 cf  
Primary=56.47 cfs 385,766 cf

**Link 173L: Existing Overland Flow Onto Site** Inflow=0.00 cfs 0 cf  
Primary=0.00 cfs 0 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 1,150,190 cf Average Runoff Depth = 1.05"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>1.45"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=76.30 cfs 480,293 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>1.45"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=76.30 cfs 480,293 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>2.70"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=1.99 cfs 9,252 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>1.91"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=4.22 cfs 16,830 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>1.82"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=10.20 cfs 45,417 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>2.70"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=1.99 cfs 9,252 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>1.91"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=4.22 cfs 16,830 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>1.82"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=10.20 cfs 45,417 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>1.45"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=76.30 cfs 480,293 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>2.00"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=3.98 cfs 15,908 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>1.82"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=10.20 cfs 45,417 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=83.77' Storage=14,913 cf Inflow=76.30 cfs 480,293 cf  
 Primary=0.00 cfs 0 cf Secondary=70.58 cfs 480,096 cf Outflow=70.58 cfs 480,096 cf

**Pond 155P: CB 36** Peak Elev=85.14' Inflow=10.20 cfs 45,417 cf  
 Primary=10.20 cfs 45,417 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=10.20 cfs 45,417 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=76.74' Inflow=10.20 cfs 45,417 cf  
 Primary=6.49 cfs 8,552 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 36,865 cf Outflow=10.20 cfs 45,417 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=82.32' Storage=258 cf Inflow=3.98 cfs 15,908 cf  
 Primary=0.00 cfs 0 cf Secondary=3.93 cfs 15,907 cf Outflow=3.93 cfs 15,907 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=83.77' Storage=14,913 cf Inflow=76.30 cfs 480,293 cf  
 Primary=0.00 cfs 0 cf Secondary=70.58 cfs 480,096 cf Outflow=70.58 cfs 480,096 cf

**7933 HydroCAD (TP40)**

Prepared by Microsoft

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.30"

Printed 7/18/2017

Page 54

**Pond 166P: CB 36** Peak Elev=85.14' Inflow=10.20 cfs 45,417 cf  
 Primary=10.20 cfs 45,417 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=10.20 cfs 45,417 cf

**Pond 167P: EX-CB 36** Peak Elev=85.14' Inflow=10.20 cfs 45,417 cf  
 Primary=10.20 cfs 45,417 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=10.20 cfs 45,417 cf

**Pond 168P: Proposed Catch Basin 18** Peak Elev=76.74' Inflow=10.20 cfs 45,417 cf  
 Primary=6.49 cfs 8,552 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 36,865 cf Outflow=10.20 cfs 45,417 cf

**Pond 171P: 42" Culvert Sump** Peak Elev=83.77' Storage=14,913 cf Inflow=76.30 cfs 480,293 cf  
 Primary=0.00 cfs 0 cf Secondary=70.58 cfs 480,107 cf Outflow=70.58 cfs 480,107 cf

**Pond 177P: West Ave. - 50% Clog** Peak Elev=82.19' Storage=390 cf Inflow=7.93 cfs 53,695 cf  
 Outflow=7.90 cfs 53,602 cf

**Pond 178P: West Ave. - No Clog** Peak Elev=82.06' Storage=207 cf Inflow=7.93 cfs 53,695 cf  
 Outflow=7.92 cfs 53,610 cf

**Link 154L: Detention** Inflow=76.39 cfs 551,502 cf  
 Primary=76.39 cfs 551,502 cf

**Link 156L: Culvert** Inflow=76.39 cfs 551,502 cf  
 Primary=76.39 cfs 551,502 cf

**Link 169L: Culvert** Inflow=75.55 cfs 541,431 cf  
 Primary=75.55 cfs 541,431 cf

**Link 170L: Detention** Inflow=76.34 cfs 551,510 cf  
 Primary=76.34 cfs 551,510 cf

**Link 171L: Culvert** Inflow=76.34 cfs 551,510 cf  
 Primary=76.34 cfs 551,510 cf

**Link 173L: Existing Overland Flow Onto Site** Inflow=0.00 cfs 0 cf  
 Primary=0.00 cfs 0 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 1,645,200 cf Average Runoff Depth = 1.50"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>2.26"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=119.79 cfs 746,275 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>2.26"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=119.79 cfs 746,275 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>3.68"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=2.66 cfs 12,605 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>2.80"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=6.16 cfs 24,711 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>2.70"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=15.09 cfs 67,343 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>3.68"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=2.66 cfs 12,605 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>2.80"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=6.16 cfs 24,711 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>2.70"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=15.09 cfs 67,343 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>2.26"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=119.79 cfs 746,275 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>2.91"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=5.74 cfs 23,134 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>2.70"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=15.09 cfs 67,343 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=85.14' Storage=37,373 cf Inflow=119.79 cfs 746,275 cf  
 Primary=25.15 cfs 28,072 cf Secondary=88.93 cfs 717,948 cf Outflow=114.08 cfs 746,020 cf

**Pond 155P: CB 36** Peak Elev=86.84' Inflow=15.09 cfs 67,343 cf  
 Primary=15.09 cfs 67,343 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=15.09 cfs 67,343 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=77.08' Inflow=15.09 cfs 67,343 cf  
 Primary=11.38 cfs 17,844 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 49,500 cf Outflow=15.09 cfs 67,343 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=82.65' Storage=960 cf Inflow=26.66 cfs 51,207 cf  
 Primary=14.45 cfs 12,893 cf Secondary=12.19 cfs 38,312 cf Outflow=26.65 cfs 51,205 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=85.14' Storage=37,373 cf Inflow=119.79 cfs 746,275 cf  
 Primary=25.15 cfs 28,072 cf Secondary=88.93 cfs 717,948 cf Outflow=114.08 cfs 746,020 cf

**7933 HydroCAD (TP40)**

Prepared by Microsoft

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Type III 24-hr 5-Year Rainfall=4.30"

Printed 7/18/2017

Page 105

**Pond 166P: CB 36** Peak Elev=86.84' Inflow=15.09 cfs 67,343 cf  
 Primary=15.09 cfs 67,343 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=15.09 cfs 67,343 cf

**Pond 167P: EX-CB 36** Peak Elev=86.84' Inflow=15.09 cfs 67,343 cf  
 Primary=15.09 cfs 67,343 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=15.09 cfs 67,343 cf

**Pond 168P: Proposed Catch Basin 18** Peak Elev=77.08' Inflow=15.09 cfs 67,343 cf  
 Primary=11.38 cfs 17,844 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 49,500 cf Outflow=15.09 cfs 67,343 cf

**Pond 171P: 42" Culvert Sump** Peak Elev=85.14' Storage=37,373 cf Inflow=119.79 cfs 746,275 cf  
 Primary=25.15 cfs 28,072 cf Secondary=88.93 cfs 717,954 cf Outflow=114.08 cfs 746,026 cf

**Pond 177P: West Ave. - 50% Clog** Peak Elev=82.51' Storage=1,405 cf Inflow=30.50 cfs 102,283 cf  
 Outflow=30.44 cfs 102,185 cf

**Pond 178P: West Ave. - No Clog** Peak Elev=82.33' Storage=740 cf Inflow=30.50 cfs 102,283 cf  
 Outflow=30.47 cfs 102,196 cf

**Link 154L: Detention** Inflow=122.57 cfs 850,581 cf  
 Primary=122.57 cfs 850,581 cf

**Link 156L: Culvert** Inflow=122.57 cfs 850,581 cf  
 Primary=122.57 cfs 850,581 cf

**Link 169L: Culvert** Inflow=107.50 cfs 823,609 cf  
 Primary=107.50 cfs 823,609 cf

**Link 170L: Detention** Inflow=122.68 cfs 850,593 cf  
 Primary=122.68 cfs 850,593 cf

**Link 171L: Culvert** Inflow=122.68 cfs 850,593 cf  
 Primary=122.68 cfs 850,593 cf

**Link 173L: Existing Overland Flow Onto Site** Inflow=14.45 cfs 12,893 cf  
 Primary=14.45 cfs 12,893 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 2,538,622 cf Average Runoff Depth = 2.31"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>2.85"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=151.48 cfs 943,125 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>2.85"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=151.48 cfs 943,125 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>4.37"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=3.13 cfs 14,965 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>3.45"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=7.53 cfs 30,401 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>3.34"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=18.57 cfs 83,238 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>4.37"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=3.13 cfs 14,965 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>3.45"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=7.53 cfs 30,401 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>3.34"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=18.57 cfs 83,238 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>2.85"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=151.48 cfs 943,125 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>3.56"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=6.99 cfs 28,331 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>3.34"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=18.57 cfs 83,238 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=85.55' Storage=46,260 cf Inflow=151.48 cfs 943,125 cf  
 Primary=53.34 cfs 82,212 cf Secondary=93.76 cfs 860,619 cf Outflow=147.10 cfs 942,831 cf

**Pond 155P: CB 36** Peak Elev=88.47' Inflow=18.57 cfs 83,238 cf  
 Primary=18.57 cfs 83,238 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=18.57 cfs 83,238 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=77.48' Inflow=18.57 cfs 83,238 cf  
 Primary=14.86 cfs 25,118 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 58,120 cf Outflow=18.57 cfs 83,238 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=82.79' Storage=1,387 cf Inflow=55.35 cfs 110,543 cf  
 Primary=40.29 cfs 55,385 cf Secondary=15.06 cfs 55,156 cf Outflow=55.35 cfs 110,541 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=85.55' Storage=46,260 cf Inflow=151.48 cfs 943,125 cf  
 Primary=53.34 cfs 82,212 cf Secondary=93.76 cfs 860,619 cf Outflow=147.10 cfs 942,831 cf

**7933 HydroCAD (TP40)**

Prepared by Microsoft

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.00"

Printed 7/18/2017

Page 156

**Pond 166P: CB 36** Peak Elev=88.47' Inflow=18.57 cfs 83,238 cf  
Primary=18.57 cfs 83,238 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=18.57 cfs 83,238 cf

**Pond 167P: EX-CB 36** Peak Elev=90.05' Inflow=18.57 cfs 83,238 cf  
Primary=17.99 cfs 83,104 cf Secondary=0.58 cfs 134 cf Tertiary=0.00 cfs 0 cf Outflow=18.57 cfs 83,238 cf

**Pond 168P: Proposed Catch Basin 18** Peak Elev=77.48' Inflow=18.57 cfs 83,238 cf  
Primary=14.86 cfs 25,118 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 58,120 cf Outflow=18.57 cfs 83,238 cf

**Pond 171P: 42" Culvert Sump** Peak Elev=85.55' Storage=46,260 cf Inflow=151.48 cfs 943,125 cf  
Primary=53.34 cfs 82,212 cf Secondary=93.76 cfs 860,622 cf Outflow=147.10 cfs 942,834 cf

**Pond 177P: West Ave. - 50% Clog** Peak Elev=82.67' Storage=2,244 cf Inflow=59.24 cfs 170,733 cf  
Outflow=59.20 cfs 170,632 cf

**Pond 178P: West Ave. - No Clog** Peak Elev=82.53' Storage=1,488 cf Inflow=59.24 cfs 170,733 cf  
Outflow=59.21 cfs 170,645 cf

**Link 154L: Detention** Inflow=158.51 cfs 1,071,334 cf  
Primary=158.51 cfs 1,071,334 cf

**Link 156L: Culvert** Inflow=158.51 cfs 1,071,334 cf  
Primary=158.51 cfs 1,071,334 cf

**Link 169L: Culvert** Inflow=117.68 cfs 999,016 cf  
Primary=117.68 cfs 999,016 cf

**Link 170L: Detention** Inflow=158.53 cfs 1,071,347 cf  
Primary=158.53 cfs 1,071,347 cf

**Link 171L: Culvert** Inflow=158.53 cfs 1,071,347 cf  
Primary=158.53 cfs 1,071,347 cf

**Link 173L: Existing Overland Flow Onto Site** Inflow=40.29 cfs 55,385 cf  
Primary=40.29 cfs 55,385 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 3,198,153 cf Average Runoff Depth = 2.91"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

**7933 HydroCAD (TP40)**

Type III 24-hr 25-Year Rainfall=5.70"

Prepared by Microsoft

Printed 7/18/2017

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Page 206

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>3.46"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=183.81 cfs 1,146,030 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>3.46"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=183.81 cfs 1,146,030 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>5.07"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=3.60 cfs 17,332 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>4.10"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=8.91 cfs 36,185 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>3.99"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=22.10 cfs 99,432 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>5.07"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=3.60 cfs 17,332 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>4.10"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=8.91 cfs 36,185 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>3.99"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=22.10 cfs 99,432 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>3.46"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=183.81 cfs 1,146,030 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>4.22"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=8.23 cfs 33,602 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>3.99"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=22.10 cfs 99,432 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=85.81' Storage=52,694 cf Inflow=183.81 cfs 1,146,030 cf  
 Primary=84.68 cfs 150,156 cf Secondary=96.76 cfs 995,543 cf Outflow=181.44 cfs 1,145,698 cf

**Pond 155P: CB 36** Peak Elev=90.06' Inflow=22.10 cfs 99,432 cf  
 Primary=21.46 cfs 99,292 cf Secondary=0.63 cfs 140 cf Tertiary=0.00 cfs 0 cf Outflow=22.10 cfs 99,432 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=77.99' Inflow=22.10 cfs 99,432 cf  
 Primary=18.39 cfs 32,831 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 66,601 cf Outflow=22.10 cfs 99,432 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=82.90' Storage=1,777 cf Inflow=87.30 cfs 183,758 cf  
 Primary=69.89 cfs 114,115 cf Secondary=17.39 cfs 69,640 cf Outflow=87.29 cfs 183,755 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=85.81' Storage=52,694 cf Inflow=183.81 cfs 1,146,030 cf  
 Primary=84.68 cfs 150,156 cf Secondary=96.76 cfs 995,543 cf Outflow=181.44 cfs 1,145,698 cf

**7933 HydroCAD (TP40)**

Type III 24-hr 25-Year Rainfall=5.70"

Prepared by Microsoft

Printed 7/18/2017

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Page 207

**Pond 166P: CB 36**

Peak Elev=90.06' Inflow=22.10 cfs 99,432 cf

Primary=21.46 cfs 99,292 cf Secondary=0.63 cfs 140 cf Tertiary=0.00 cfs 0 cf Outflow=22.10 cfs 99,432 cf

**Pond 167P: EX-CB 36**

Peak Elev=90.32' Inflow=22.10 cfs 99,432 cf

Primary=18.19 cfs 97,319 cf Secondary=3.90 cfs 2,113 cf Tertiary=0.00 cfs 0 cf Outflow=22.10 cfs 99,432 cf

**Pond 168P: Proposed Catch Basin 18**

Peak Elev=77.99' Inflow=22.10 cfs 99,432 cf

Primary=18.39 cfs 32,831 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 66,601 cf Outflow=22.10 cfs 99,432 cf

**Pond 171P: 42" Culvert Sump**

Peak Elev=85.81' Storage=52,694 cf Inflow=183.81 cfs 1,146,030 cf

Primary=84.68 cfs 150,156 cf Secondary=96.76 cfs 995,543 cf Outflow=181.44 cfs 1,145,698 cf

**Pond 177P: West Ave. - 50% Clog**

Peak Elev=82.80' Storage=3,003 cf Inflow=91.25 cfs 252,942 cf

Outflow=91.22 cfs 252,838 cf

**Pond 178P: West Ave. - No Clog**

Peak Elev=82.66' Storage=2,179 cf Inflow=91.25 cfs 252,942 cf

Outflow=91.22 cfs 252,852 cf

**Link 154L: Detention**

Inflow=196.32 cfs 1,298,543 cf

Primary=196.32 cfs 1,298,543 cf

**Link 156L: Culvert**

Inflow=196.32 cfs 1,298,543 cf

Primary=196.32 cfs 1,298,543 cf

**Link 169L: Culvert**

Inflow=126.01 cfs 1,164,615 cf

Primary=126.01 cfs 1,164,615 cf

**Link 170L: Detention**

Inflow=196.34 cfs 1,298,557 cf

Primary=196.34 cfs 1,298,557 cf

**Link 171L: Culvert**

Inflow=196.34 cfs 1,298,557 cf

Primary=196.34 cfs 1,298,557 cf

**Link 173L: Existing Overland Flow Onto Site**

Inflow=69.89 cfs 114,115 cf

Primary=69.89 cfs 114,115 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 3,877,023 cf Average Runoff Depth = 3.53"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

**7933 HydroCAD (TP40)**

Type III 24-hr 50-Year Rainfall=6.40"

Prepared by Microsoft

Printed 7/18/2017

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Page 257

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>4.09"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=216.76 cfs 1,353,485 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>4.09"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=216.76 cfs 1,353,485 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>5.76"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=4.07 cfs 19,703 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>4.77"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=10.29 cfs 42,037 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>4.64"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=25.61 cfs 115,844 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>5.76"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=4.07 cfs 19,703 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>4.77"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=10.29 cfs 42,037 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>4.64"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=25.61 cfs 115,844 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>4.09"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=216.76 cfs 1,353,485 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>4.89"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=9.47 cfs 38,927 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>4.64"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=25.61 cfs 115,844 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=86.00' Storage=57,631 cf Inflow=216.76 cfs 1,353,485 cf  
 Primary=116.12 cfs 227,991 cf Secondary=98.84 cfs 1,125,122 cf Outflow=214.96 cfs 1,353,113 cf

**Pond 155P: CB 36** Peak Elev=90.31' Inflow=25.61 cfs 115,844 cf  
 Primary=21.87 cfs 113,976 cf Secondary=3.74 cfs 1,868 cf Tertiary=0.00 cfs 0 cf Outflow=25.61 cfs 115,844 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=78.61' Inflow=25.61 cfs 115,844 cf  
 Primary=21.90 cfs 40,891 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 74,953 cf Outflow=25.61 cfs 115,844 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=82.99' Storage=2,128 cf Inflow=119.35 cfs 266,918 cf  
 Primary=100.10 cfs 184,085 cf Secondary=19.25 cfs 82,829 cf Outflow=119.35 cfs 266,914 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=86.00' Storage=57,631 cf Inflow=216.76 cfs 1,353,485 cf  
 Primary=116.12 cfs 227,991 cf Secondary=98.84 cfs 1,125,122 cf Outflow=214.96 cfs 1,353,113 cf

**7933 HydroCAD (TP40)**

Type III 24-hr 50-Year Rainfall=6.40"

Prepared by Microsoft

Printed 7/18/2017

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Page 258

**Pond 166P: CB 36** Peak Elev=90.31' Inflow=25.61 cfs 115,844 cf  
 Primary=21.87 cfs 113,976 cf Secondary=3.74 cfs 1,868 cf Tertiary=0.00 cfs 0 cf Outflow=25.61 cfs 115,844 cf

**Pond 167P: EX-CB 36** Peak Elev=90.49' Inflow=25.61 cfs 115,844 cf  
 Primary=18.32 cfs 110,628 cf Secondary=7.28 cfs 5,216 cf Tertiary=0.00 cfs 0 cf Outflow=25.61 cfs 115,844 cf

**Pond 168P: Proposed Catch Basin 18** Peak Elev=78.61' Inflow=25.61 cfs 115,844 cf  
 Primary=21.90 cfs 40,891 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 74,953 cf Outflow=25.61 cfs 115,844 cf

**Pond 171P: 42" Culvert Sump** Peak Elev=86.00' Storage=57,631 cf Inflow=216.76 cfs 1,353,485 cf  
 Primary=116.12 cfs 227,991 cf Secondary=98.84 cfs 1,125,122 cf Outflow=214.96 cfs 1,353,113 cf

**Pond 177P: West Ave. - 50% Clog** Peak Elev=82.92' Storage=3,910 cf Inflow=123.37 cfs 344,981 cf  
 Outflow=123.10 cfs 344,875 cf

**Pond 178P: West Ave. - No Clog** Peak Elev=82.77' Storage=2,816 cf Inflow=123.37 cfs 344,981 cf  
 Outflow=123.35 cfs 344,889 cf

**Link 154L: Detention** Inflow=232.51 cfs 1,530,591 cf  
 Primary=232.51 cfs 1,530,591 cf

**Link 156L: Culvert** Inflow=232.51 cfs 1,530,591 cf  
 Primary=232.51 cfs 1,530,591 cf

**Link 169L: Culvert** Inflow=133.12 cfs 1,323,795 cf  
 Primary=133.12 cfs 1,323,795 cf

**Link 170L: Detention** Inflow=233.21 cfs 1,530,605 cf  
 Primary=233.21 cfs 1,530,605 cf

**Link 171L: Culvert** Inflow=233.21 cfs 1,530,605 cf  
 Primary=233.21 cfs 1,530,605 cf

**Link 173L: Existing Overland Flow Onto Site** Inflow=100.10 cfs 184,085 cf  
 Primary=100.10 cfs 184,085 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 4,570,394 cf Average Runoff Depth = 4.16"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

**7933 HydroCAD (TP40)**

Type III 24-hr 100-Year Rainfall=7.20"

Prepared by Microsoft

Printed 7/18/2017

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Page 308

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 157S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>4.82"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=254.61 cfs 1,594,818 cf

**Subcatchment 158S: Conveyed to 42"** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>4.82"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=254.61 cfs 1,594,818 cf

**Subcatchment 159S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>6.55"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=4.60 cfs 22,417 cf

**Subcatchment 160S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>5.53"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=11.86 cfs 48,787 cf

**Subcatchment 161S: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>5.40"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=29.62 cfs 134,800 cf

**Subcatchment 164S: Proposed Site** Runoff Area=41,059 sf 88.67% Impervious Runoff Depth>6.55"  
 Flow Length=723' Tc=18.7 min CN=94.7 Runoff=4.60 cfs 22,417 cf

**Subcatchment 165S: Free Flow to West** Runoff Area=105,793 sf 2.33% Impervious Runoff Depth>5.53"  
 Flow Length=549' Tc=14.2 min CN=85.9 Runoff=11.86 cfs 48,787 cf

**Subcatchment 166S: Existing CB-36** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>5.40"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=29.62 cfs 134,800 cf

**Subcatchment 170S: Existing Conveyed** Runoff Area=3,969,875 sf 0.00% Impervious Runoff Depth>4.82"  
 Flow Length=2,343' Tc=39.8 min CN=79.8 Runoff=254.61 cfs 1,594,818 cf

**Subcatchment 172S: Existing Free Flow to** Runoff Area=95,537 sf 0.00% Impervious Runoff Depth>5.66"  
 Flow Length=549' Tc=14.2 min CN=87.0 Runoff=10.89 cfs 45,061 cf

**Subcatchment CB#18: CB#18** Runoff Area=299,326 sf 0.23% Impervious Runoff Depth>5.40"  
 Flow Length=723' Tc=18.7 min CN=84.8 Runoff=29.62 cfs 134,800 cf

**Pond 150P: 42" Culvert Sump** Peak Elev=86.17' Storage=62,304 cf Inflow=254.61 cfs 1,594,818 cf  
 Primary=152.39 cfs 325,847 cf Secondary=100.69 cfs 1,268,555 cf Outflow=253.08 cfs 1,594,402 cf

**Pond 155P: CB 36** Peak Elev=90.50' Inflow=29.62 cfs 134,800 cf  
 Primary=22.19 cfs 129,755 cf Secondary=7.43 cfs 5,046 cf Tertiary=0.00 cfs 0 cf Outflow=29.62 cfs 134,800 cf

**Pond 163P: Proposed Catch Basin 18** Peak Elev=79.44' Inflow=29.62 cfs 134,800 cf  
 Primary=25.91 cfs 50,488 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 84,313 cf Outflow=29.62 cfs 134,800 cf

**Pond 164P: Existing West Ave. Ponding** Peak Elev=83.08' Storage=2,522 cf Inflow=156.26 cfs 370,956 cf  
 Primary=136.12 cfs 274,739 cf Secondary=20.13 cfs 96,213 cf Outflow=156.25 cfs 370,952 cf

**Pond 165P: 42" Culvert Sump** Peak Elev=86.17' Storage=62,304 cf Inflow=254.61 cfs 1,594,818 cf  
 Primary=152.39 cfs 325,847 cf Secondary=100.69 cfs 1,268,555 cf Outflow=253.08 cfs 1,594,402 cf

**7933 HydroCAD (TP40)**

Prepared by Microsoft

HydroCAD® 10.00-13 s/n 08722 © 2014 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.20"

Printed 7/18/2017

Page 309

**Pond 166P: CB 36**

Peak Elev=90.50' Inflow=29.62 cfs 134,800 cf  
 Primary=22.19 cfs 129,755 cf Secondary=7.43 cfs 5,046 cf Tertiary=0.00 cfs 0 cf Outflow=29.62 cfs 134,800 cf

**Pond 167P: EX-CB 36**

Peak Elev=90.64' Inflow=29.62 cfs 134,800 cf  
 Primary=18.44 cfs 125,147 cf Secondary=10.99 cfs 9,606 cf Tertiary=0.19 cfs 48 cf Outflow=29.62 cfs 134,800 cf

**Pond 168P: Proposed Catch Basin 18**

Peak Elev=79.44' Inflow=29.62 cfs 134,800 cf  
 Primary=25.91 cfs 50,488 cf Secondary=0.00 cfs 0 cf Tertiary=3.71 cfs 84,313 cf Outflow=29.62 cfs 134,800 cf

**Pond 171P: 42" Culvert Sump**

Peak Elev=86.17' Storage=62,304 cf Inflow=254.61 cfs 1,594,818 cf  
 Primary=152.39 cfs 325,847 cf Secondary=100.69 cfs 1,268,555 cf Outflow=253.08 cfs 1,594,402 cf

**Pond 177P: West Ave. - 50% Clog**

Peak Elev=83.31' Storage=7,575 cf Inflow=160.34 cfs 458,947 cf  
 Outflow=158.57 cfs 458,837 cf

**Pond 178P: West Ave. - No Clog**

Peak Elev=82.87' Storage=3,504 cf Inflow=160.34 cfs 458,947 cf  
 Outflow=160.31 cfs 458,854 cf

**Link 154L: Detention**

Inflow=271.41 cfs 1,800,297 cf  
 Primary=271.41 cfs 1,800,297 cf

**Link 156L: Culvert**

Inflow=271.41 cfs 1,800,297 cf  
 Primary=271.41 cfs 1,800,297 cf

**Link 169L: Culvert**

Inflow=140.53 cfs 1,499,521 cf  
 Primary=140.53 cfs 1,499,521 cf

**Link 170L: Detention**

Inflow=274.85 cfs 1,800,313 cf  
 Primary=274.85 cfs 1,800,313 cf

**Link 171L: Culvert**

Inflow=274.85 cfs 1,800,313 cf  
 Primary=274.85 cfs 1,800,313 cf

**Link 173L: Existing Overland Flow Onto Site**

Inflow=136.12 cfs 274,739 cf  
 Primary=136.12 cfs 274,739 cf

**Total Runoff Area = 13,196,844 sf Runoff Volume = 5,376,326 cf Average Runoff Depth = 4.89"**  
**99.40% Pervious = 13,117,067 sf 0.60% Impervious = 79,777 sf**

**Summary for Subcatchment 157S: Conveyed to 42" Culvert**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 254.61 cfs @ 12.52 hrs, Volume= 1,594,818 cf, Depth> 4.82"

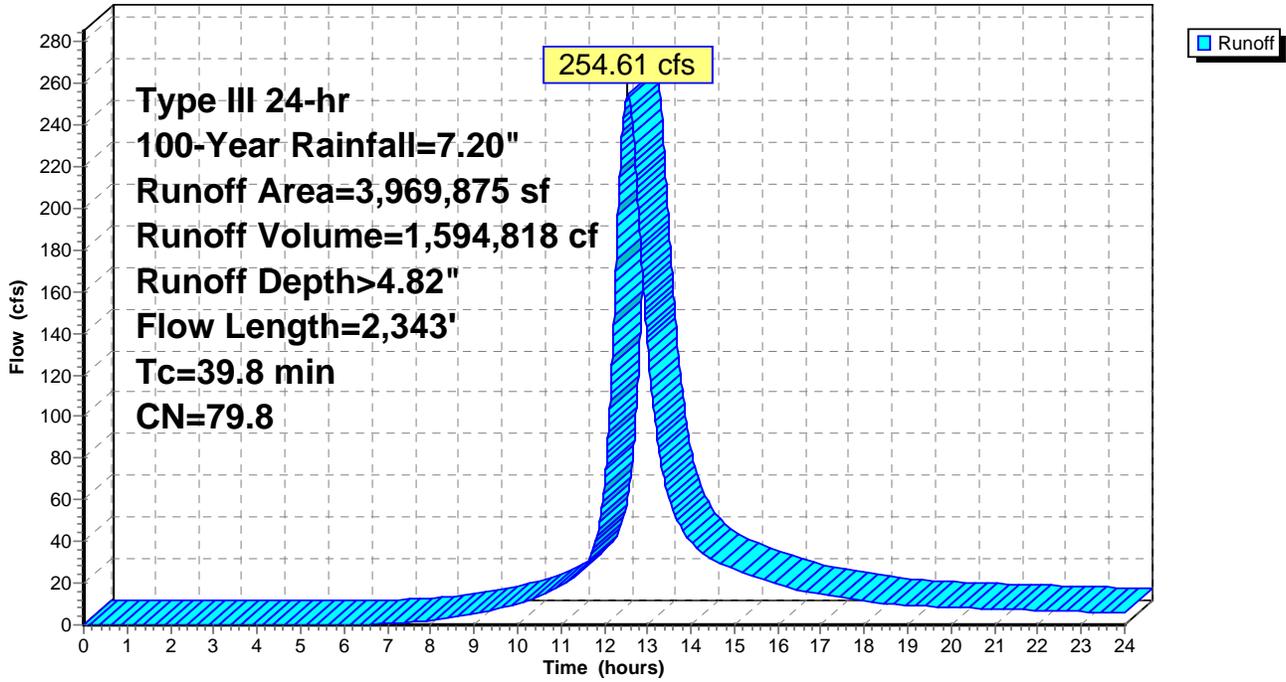
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	184,375	79.0	R 1-Acre Zone, HSG C
*	1,359,379	80.0	R 1/2-Acre Zone, HSG C
*	1,375,164	81.0	R 1/3-Acre Zone, HSG C
*	591,829	72.0	R 1/3-Acre Zone, HSG B
*	39,694	85.0	DMR Zone, HSG B
*	419,434	86.0	R 1/5-Acre Zone, HSG C
	3,969,875	79.8	Weighted Average
	3,969,875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.1	300	0.0220	0.16		<b>Sheet Flow, 300 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
0.6	75	0.0200	2.12		<b>Shallow Concentrated Flow, 75 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.1	57	0.3690	9.11		<b>Shallow Concentrated Flow, 57 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
0.4	102	0.0740	4.08		<b>Shallow Concentrated Flow, 102 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
1.9	275	0.0250	2.37		<b>Shallow Concentrated Flow, 275 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
0.9	177	0.0260	3.27		<b>Shallow Concentrated Flow, 177 LF of Paved Shallow Conc Flow</b> Paved Kv= 20.3 fps
3.8	1,357	0.0170	5.91	2.37	<b>Channel Flow, 1,357 LF of Channel Flow</b> Area= 0.4 sf Perim= 1.6' r= 0.25' n= 0.013 Concrete pipe, bends & connections
39.8	2,343	Total			

Subcatchment 157S: Conveyed to 42" Culvert

Hydrograph



**Summary for Subcatchment 158S: Conveyed to 42" Culvert**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 254.61 cfs @ 12.52 hrs, Volume= 1,594,818 cf, Depth> 4.82"

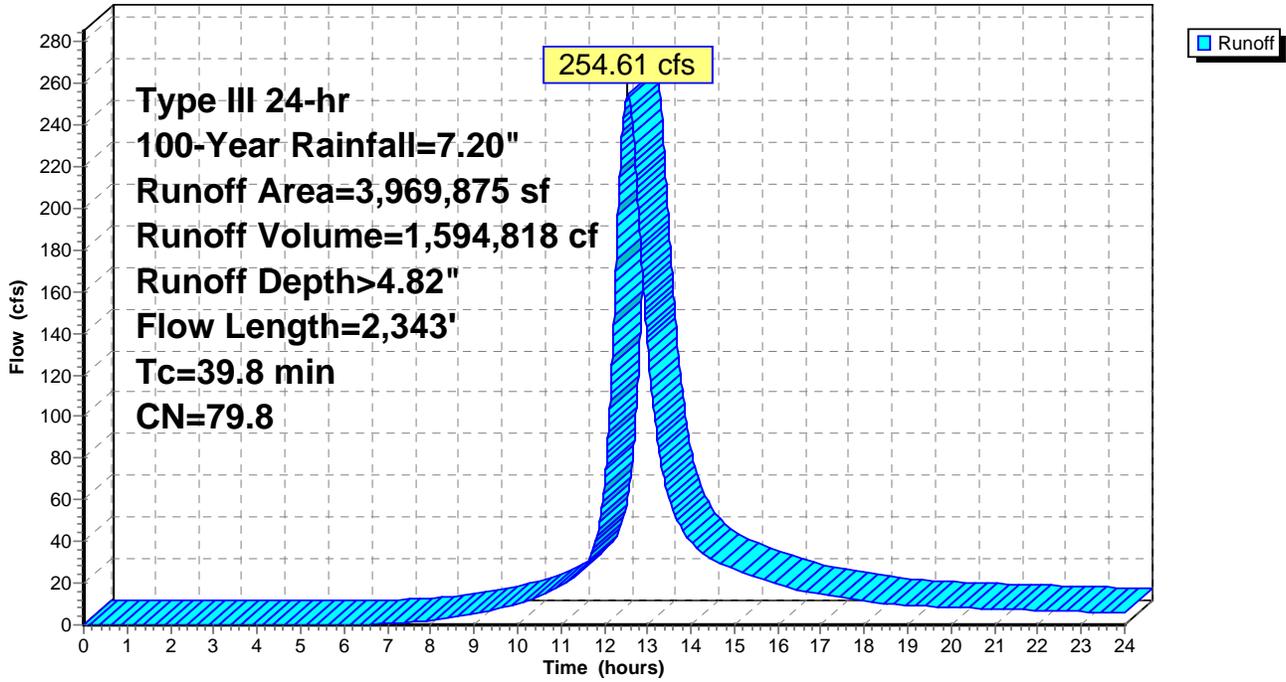
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	184,375	79.0	R 1-Acre Zone, HSG C
*	1,359,379	80.0	R 1/2-Acre Zone, HSG C
*	1,375,164	81.0	R 1/3-Acre Zone, HSG C
*	591,829	72.0	R 1/3-Acre Zone, HSG B
*	39,694	85.0	DMR Zone, HSG B
*	419,434	86.0	R 1/5-Acre Zone, HSG C
	3,969,875	79.8	Weighted Average
	3,969,875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.1	300	0.0220	0.16		<b>Sheet Flow, 300 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
0.6	75	0.0200	2.12		<b>Shallow Concentrated Flow, 75 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.1	57	0.3690	9.11		<b>Shallow Concentrated Flow, 57 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
0.4	102	0.0740	4.08		<b>Shallow Concentrated Flow, 102 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
1.9	275	0.0250	2.37		<b>Shallow Concentrated Flow, 275 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
0.9	177	0.0260	3.27		<b>Shallow Concentrated Flow, 177 LF of Paved Shallow Conc Flow</b> Paved Kv= 20.3 fps
3.8	1,357	0.0170	5.91	2.37	<b>Channel Flow, 1,357 LF of Channel Flow</b> Area= 0.4 sf Perim= 1.6' r= 0.25' n= 0.013 Concrete pipe, bends & connections
39.8	2,343	Total			

### Subcatchment 158S: Conveyed to 42" Culvert

Hydrograph



**Summary for Subcatchment 159S: Proposed Site Conveyed Straight to Culvert**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 4.60 cfs @ 12.24 hrs, Volume= 22,417 cf, Depth> 6.55"

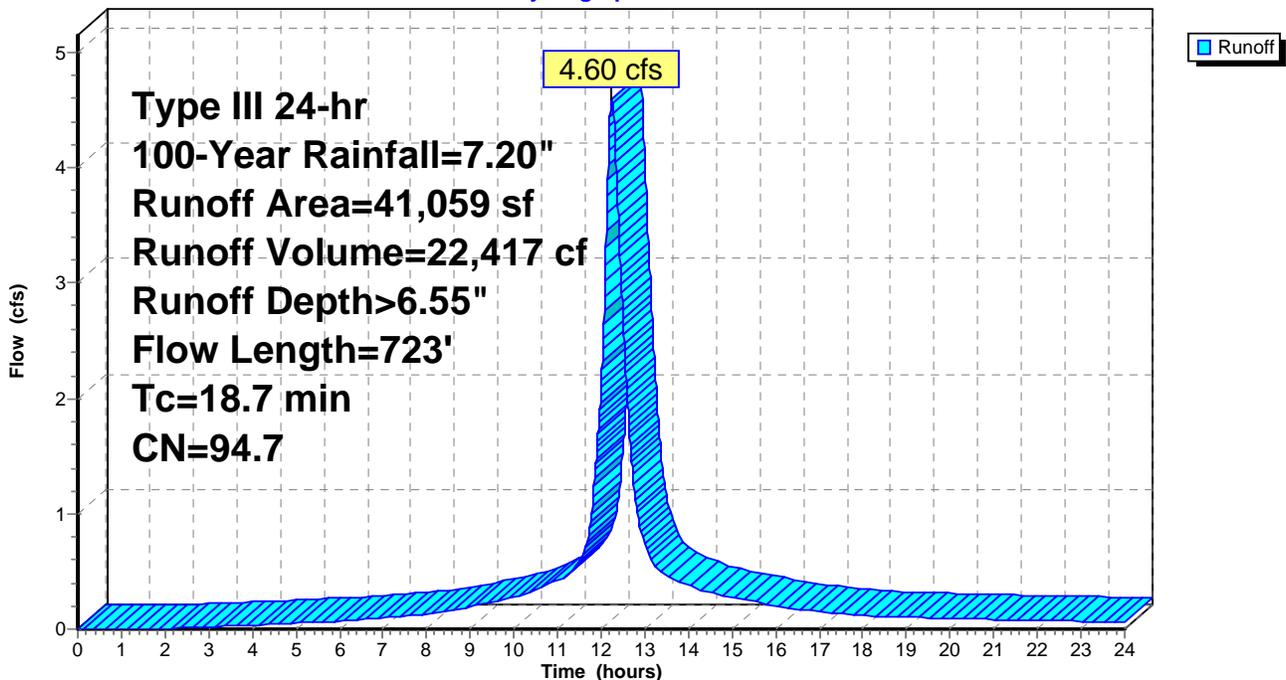
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	36,407	98.0	
*	4,652	69.0	
	41,059	94.7	Weighted Average
	4,652		11.33% Pervious Area
	36,407		88.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	178	0.0450	0.19		<b>Sheet Flow, 178 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
2.3	411	0.0390	2.96		<b>Shallow Concentrated Flow, 411 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.5	134	0.0540	4.72		<b>Shallow Concentrated Flow, 134 LF of Shallow Conc. Flow</b> Paved Kv= 20.3 fps
18.7	723	Total			

**Subcatchment 159S: Proposed Site Conveyed Straight to Culvert**

Hydrograph



**Summary for Subcatchment 160S: Free Flow to West Ave.**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 11.86 cfs @ 12.19 hrs, Volume= 48,787 cf, Depth> 5.53"

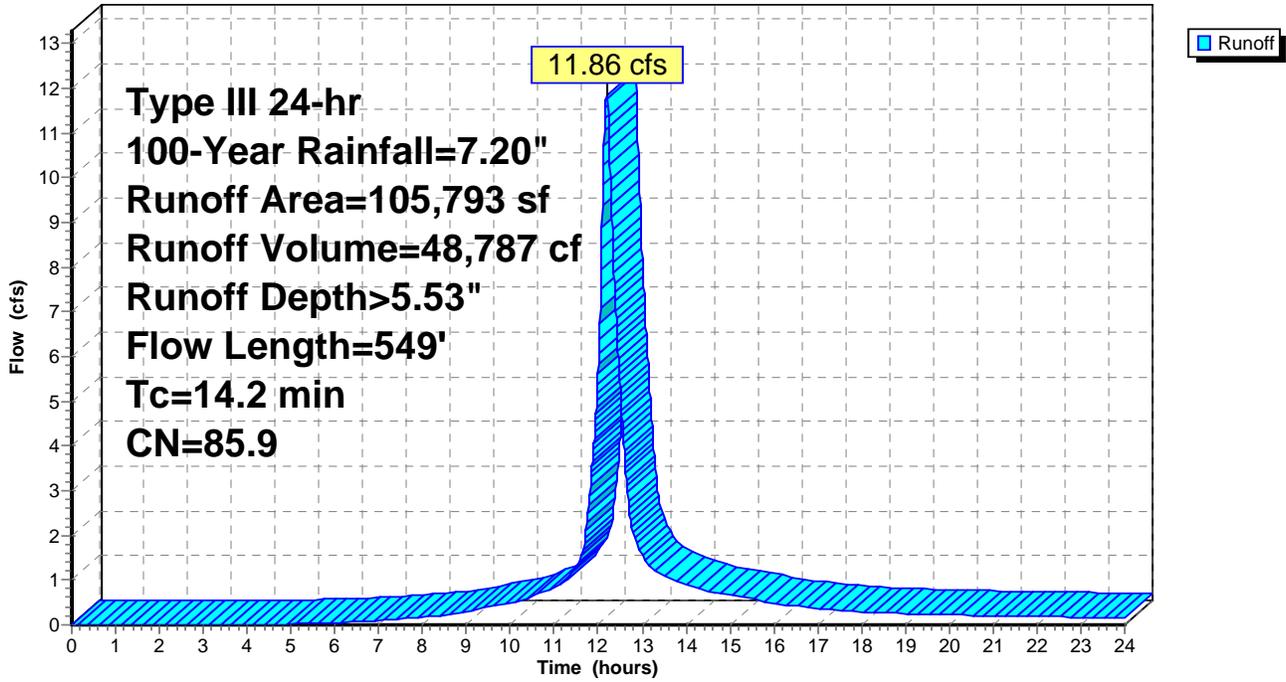
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

Area (sf)	CN	Description
* 15,973	92.0	DC Zone, HSG B
* 79,564	86.0	R 1/5-Acre Zone, HSG C
* 2,460	98.0	
* 7,796	69.0	
105,793	85.9	Weighted Average
103,333		97.67% Pervious Area
2,460		2.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	144	0.0590	0.20		<b>Sheet Flow, 144 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
1.1	195	0.0410	3.04		<b>Shallow Concentrated Flow, 195 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
1.1	210	0.0250	3.21		<b>Shallow Concentrated Flow, 210 LF of Paved Shallow Conc Flow</b> Paved Kv= 20.3 fps
14.2	549	Total			

Subcatchment 160S: Free Flow to West Ave.

Hydrograph



**Summary for Subcatchment 161S: CB#18**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Depth> 5.40"

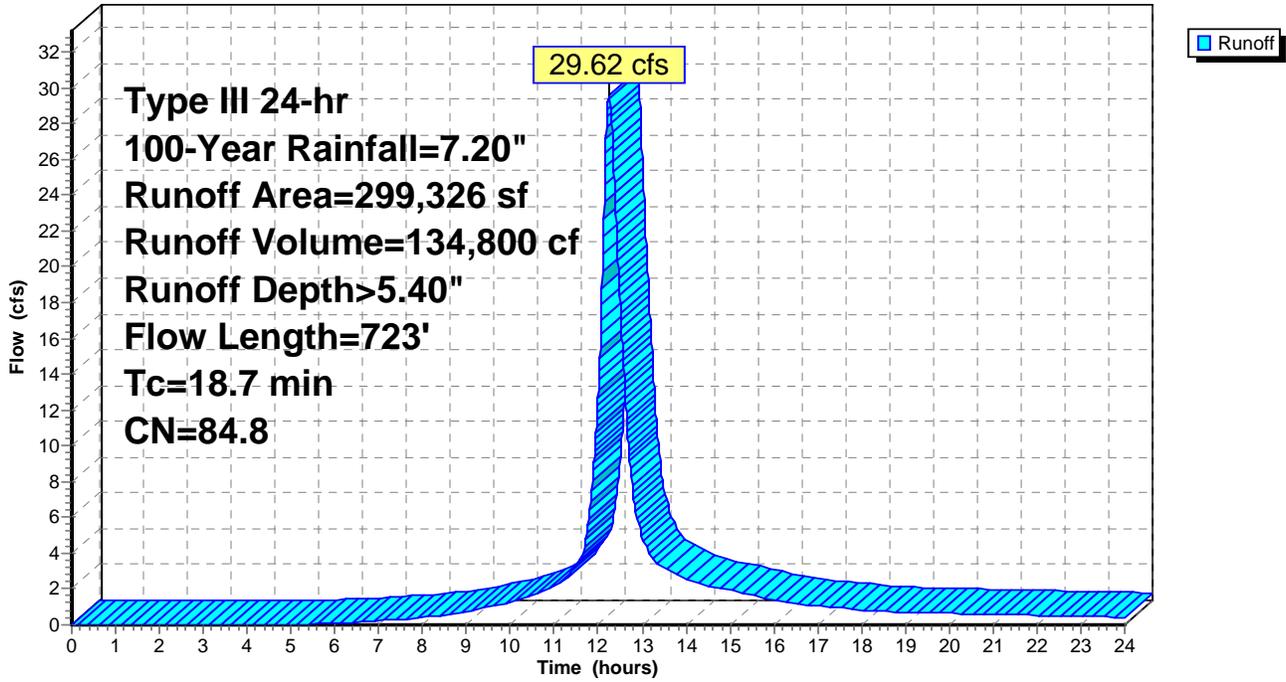
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

Area (sf)	CN	Description
* 571	81.0	R 1/3-Acre Zone, HSG C
* 5,845	72.0	R 1/3-Acre Zone, HSG B
* 116,113	85.0	DMR Zone, HSG B
* 48,388	79.0	R 1/5-Acre Zone HSG B
* 85,157	86.0	R 1/5-Acre Zone, HSG C
* 12,877	92.0	DC Zone, HSG B
* 25,571	92.0	SB Zone, HSG B
* 681	98.0	On-site Impervious
* 4,123	69.0	On-site Pervious
299,326	84.8	Weighted Average
298,645		99.77% Pervious Area
681		0.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	178	0.0450	0.19		<b>Sheet Flow, 178 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
2.3	411	0.0390	2.96		<b>Shallow Concentrated Flow, 411 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.5	134	0.0540	4.72		<b>Shallow Concentrated Flow, 134 LF of Shallow Conc. Flow</b> Paved Kv= 20.3 fps
18.7	723	Total			

Subcatchment 161S: CB#18

Hydrograph



**Summary for Subcatchment 164S: Proposed Site Conveyed Straight to Culvert**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 4.60 cfs @ 12.24 hrs, Volume= 22,417 cf, Depth> 6.55"

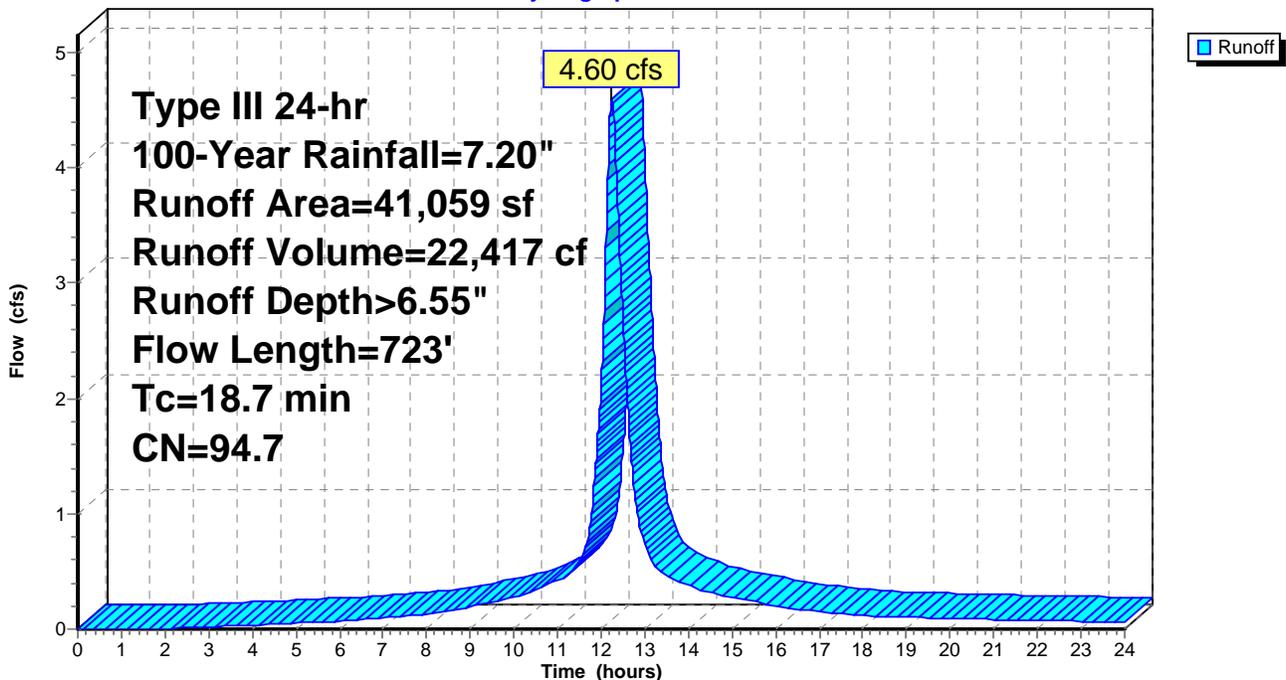
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	36,407	98.0	
*	4,652	69.0	
	41,059	94.7	Weighted Average
	4,652		11.33% Pervious Area
	36,407		88.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	178	0.0450	0.19		<b>Sheet Flow, 178 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
2.3	411	0.0390	2.96		<b>Shallow Concentrated Flow, 411 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.5	134	0.0540	4.72		<b>Shallow Concentrated Flow, 134 LF of Shallow Conc. Flow</b> Paved Kv= 20.3 fps
18.7	723	Total			

**Subcatchment 164S: Proposed Site Conveyed Straight to Culvert**

Hydrograph



**Summary for Subcatchment 165S: Free Flow to West Ave.**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 11.86 cfs @ 12.19 hrs, Volume= 48,787 cf, Depth> 5.53"

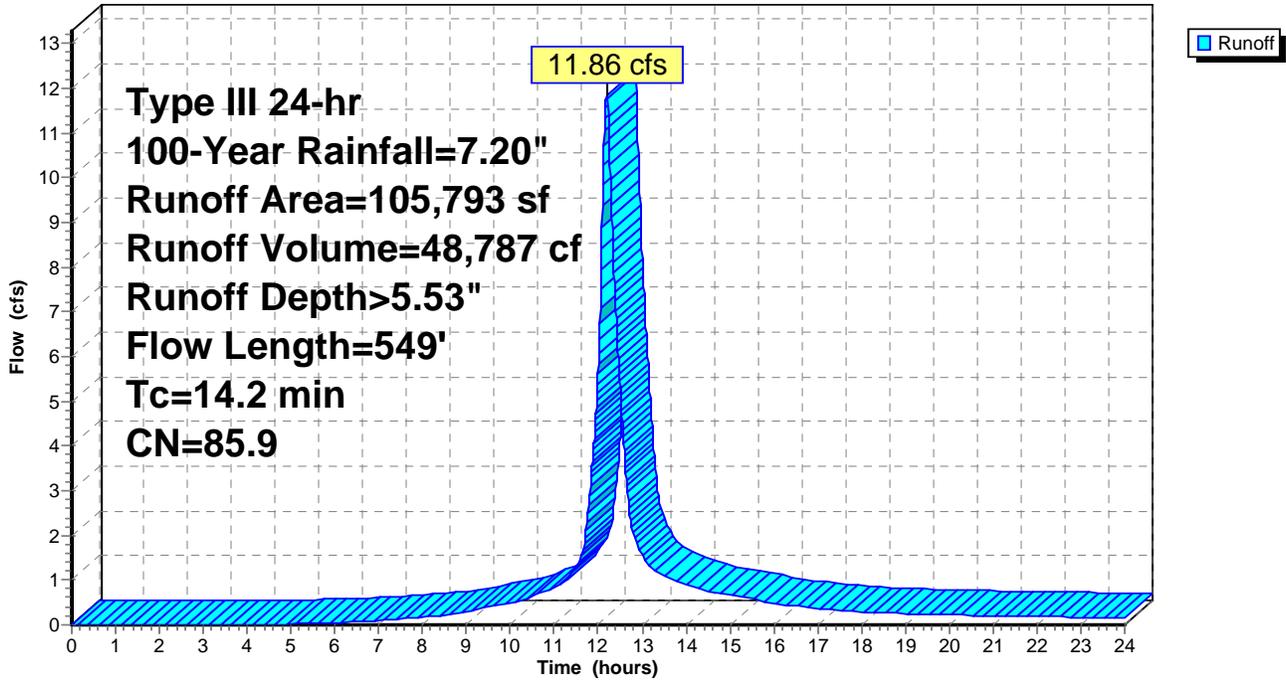
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

Area (sf)	CN	Description
* 15,973	92.0	DC Zone, HSG B
* 79,564	86.0	R 1/5-Acre Zone, HSG C
* 2,460	98.0	
* 7,796	69.0	
105,793	85.9	Weighted Average
103,333		97.67% Pervious Area
2,460		2.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	144	0.0590	0.20		<b>Sheet Flow, 144 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
1.1	195	0.0410	3.04		<b>Shallow Concentrated Flow, 195 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
1.1	210	0.0250	3.21		<b>Shallow Concentrated Flow, 210 LF of Paved Shallow Conc Flow</b> Paved Kv= 20.3 fps
14.2	549	Total			

**Subcatchment 165S: Free Flow to West Ave.**

Hydrograph



**Summary for Subcatchment 166S: Existing CB-36**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Depth> 5.40"

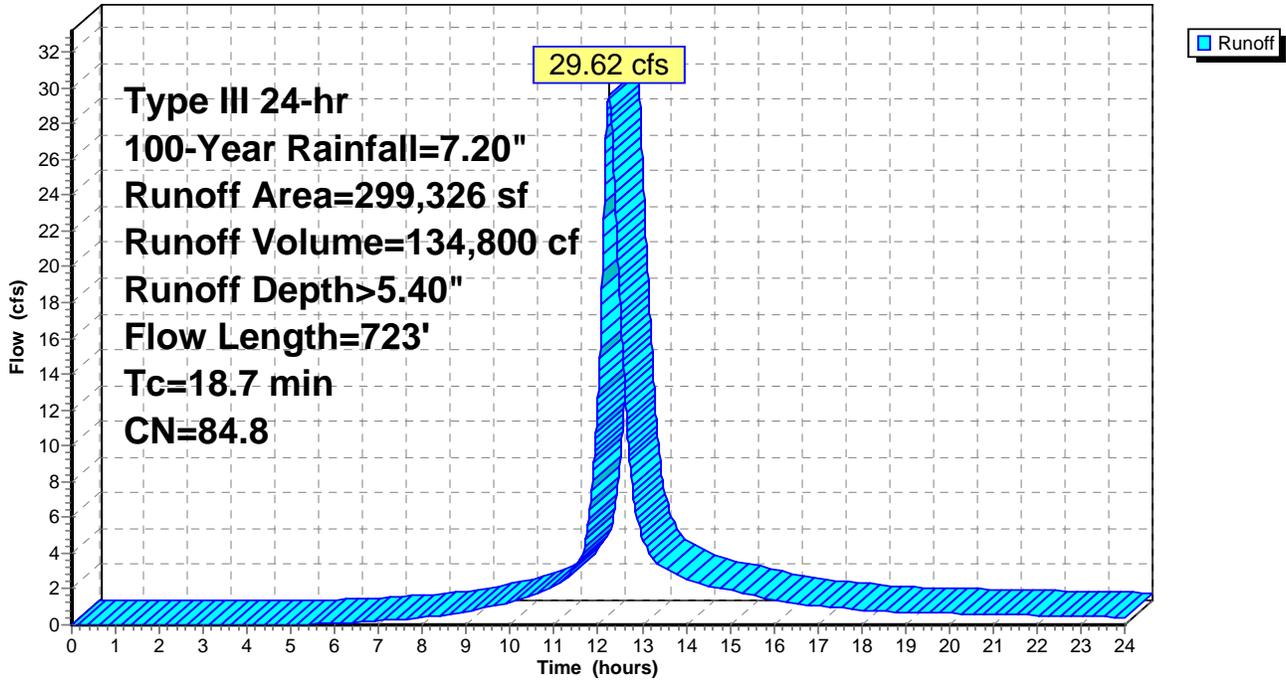
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

Area (sf)	CN	Description
* 571	81.0	R 1/3-Acre Zone, HSG C
* 5,845	72.0	R 1/3-Acre Zone, HSG B
* 116,113	85.0	DMR Zone, HSG B
* 48,388	79.0	R 1/5-Acre Zone HSG B
* 85,157	86.0	R 1/5-Acre Zone, HSG C
* 12,877	92.0	DC Zone, HSG B
* 25,571	92.0	SB Zone, HSG B
* 681	98.0	On-site Impervious
* 4,123	69.0	On-site Pervious
299,326	84.8	Weighted Average
298,645		99.77% Pervious Area
681		0.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	178	0.0450	0.19		<b>Sheet Flow, 178 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
2.3	411	0.0390	2.96		<b>Shallow Concentrated Flow, 411 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.5	134	0.0540	4.72		<b>Shallow Concentrated Flow, 134 LF of Shallow Conc. Flow</b> Paved Kv= 20.3 fps
18.7	723	Total			

### Subcatchment 166S: Existing CB-36

Hydrograph



**Summary for Subcatchment 170S: Existing Conveyed to 42" Culvert**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 254.61 cfs @ 12.52 hrs, Volume= 1,594,818 cf, Depth> 4.82"

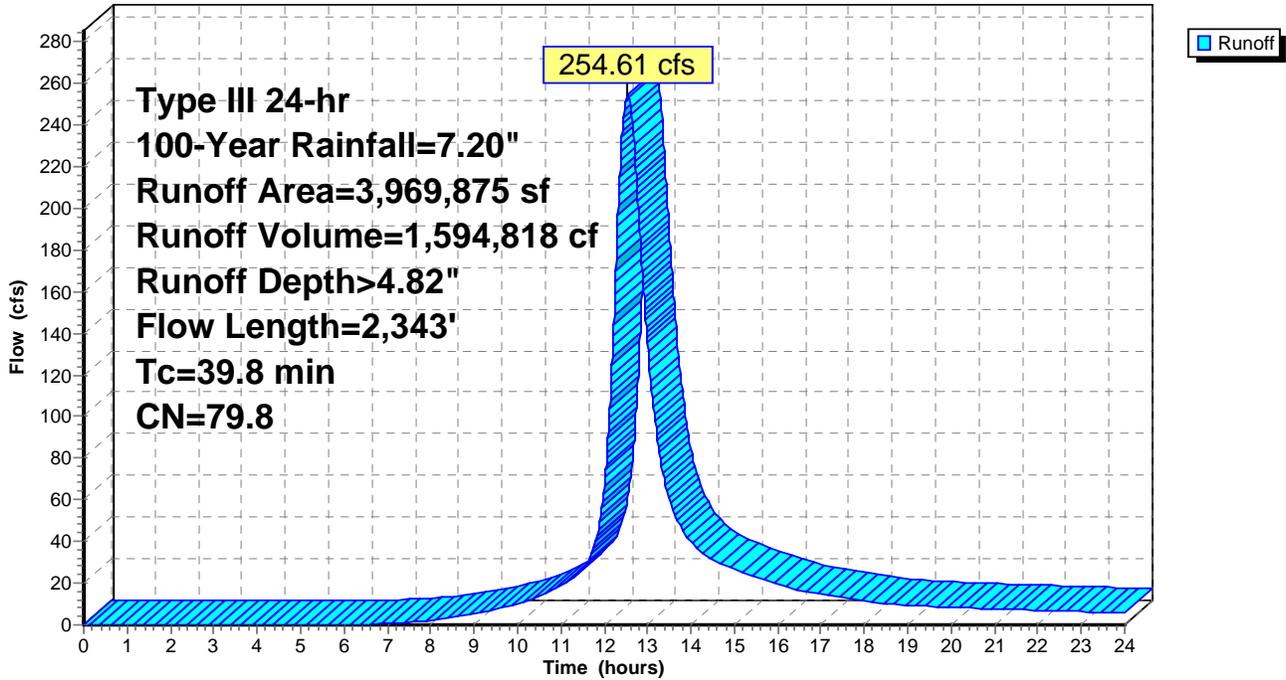
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

Area (sf)	CN	Description
* 184,375	79.0	R 1-Acre Zone, HSG C
* 1,359,379	80.0	R 1/2-Acre Zone, HSG C
* 1,375,164	81.0	R 1/3-Acre Zone, HSG C
* 591,829	72.0	R 1/3-Acre Zone, HSG B
* 39,694	85.0	DMR Zone, HSG B
* 419,434	86.0	R 1/5-Acre Zone, HSG C
3,969,875	79.8	Weighted Average
3,969,875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.1	300	0.0220	0.16		<b>Sheet Flow, 300 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
0.6	75	0.0200	2.12		<b>Shallow Concentrated Flow, 75 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.1	57	0.3690	9.11		<b>Shallow Concentrated Flow, 57 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
0.4	102	0.0740	4.08		<b>Shallow Concentrated Flow, 102 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
1.9	275	0.0250	2.37		<b>Shallow Concentrated Flow, 275 LF of Lawn Shallow Conc Flow</b> Grassed Waterway Kv= 15.0 fps
0.9	177	0.0260	3.27		<b>Shallow Concentrated Flow, 177 LF of Paved Shallow Conc Flow</b> Paved Kv= 20.3 fps
3.8	1,357	0.0170	5.91	2.37	<b>Channel Flow, 1,357 LF of Channel Flow</b> Area= 0.4 sf Perim= 1.6' r= 0.25' n= 0.013 Concrete pipe, bends & connections
39.8	2,343	Total			

### Subcatchment 170S: Existing Conveyed to 42" Culvert

Hydrograph



**Summary for Subcatchment 172S: Existing Free Flow to West Ave.**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 10.89 cfs @ 12.19 hrs, Volume= 45,061 cf, Depth> 5.66"

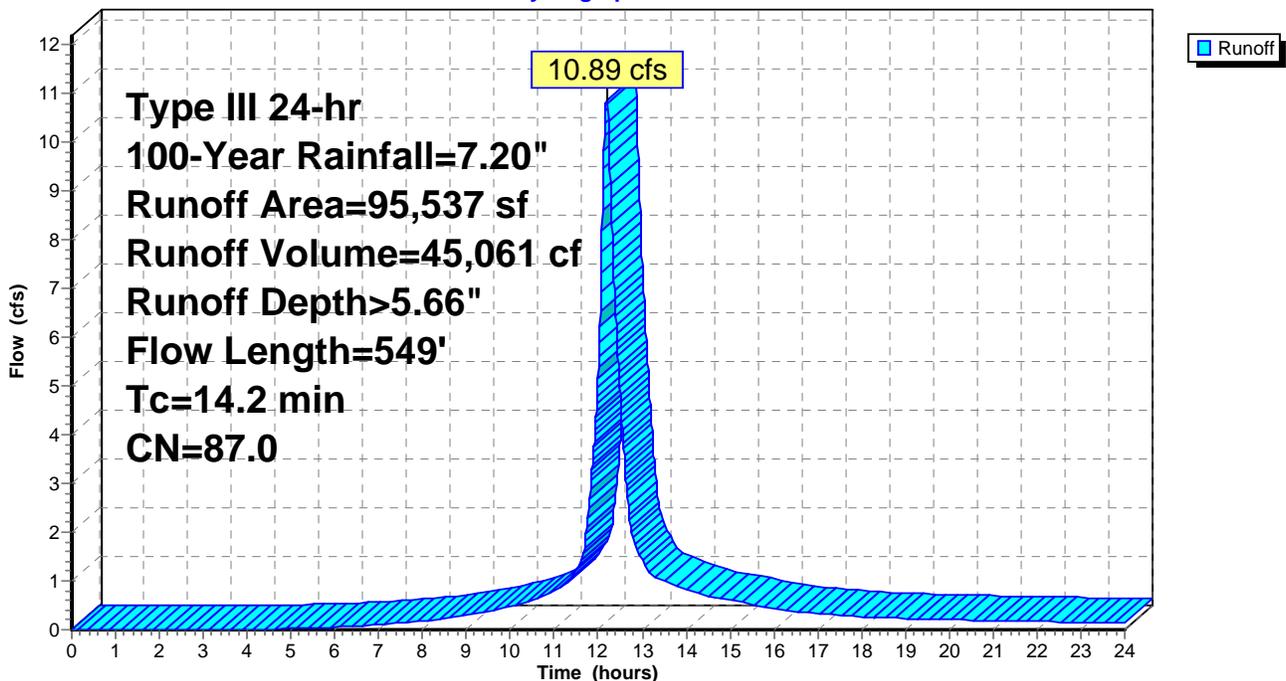
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

	Area (sf)	CN	Description
*	15,973	92.0	DC Zone, HSG B
*	79,564	86.0	R 1/5-Acre Zone, HSG C
	95,537	87.0	Weighted Average
	95,537		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	144	0.0590	0.20		<b>Sheet Flow, 144 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
1.1	195	0.0410	3.04		<b>Shallow Concentrated Flow, 195 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
1.1	210	0.0250	3.21		<b>Shallow Concentrated Flow, 210 LF of Paved Shallow Conc Flow</b> Paved Kv= 20.3 fps
14.2	549	Total			

**Subcatchment 172S: Existing Free Flow to West Ave.**

Hydrograph



**Summary for Subcatchment CB#18: CB#18**

Area contributing to the north culvert. All of offsite north and the northwestern portion of the site including a portion of the R1 roof.

Runoff = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Depth> 5.40"

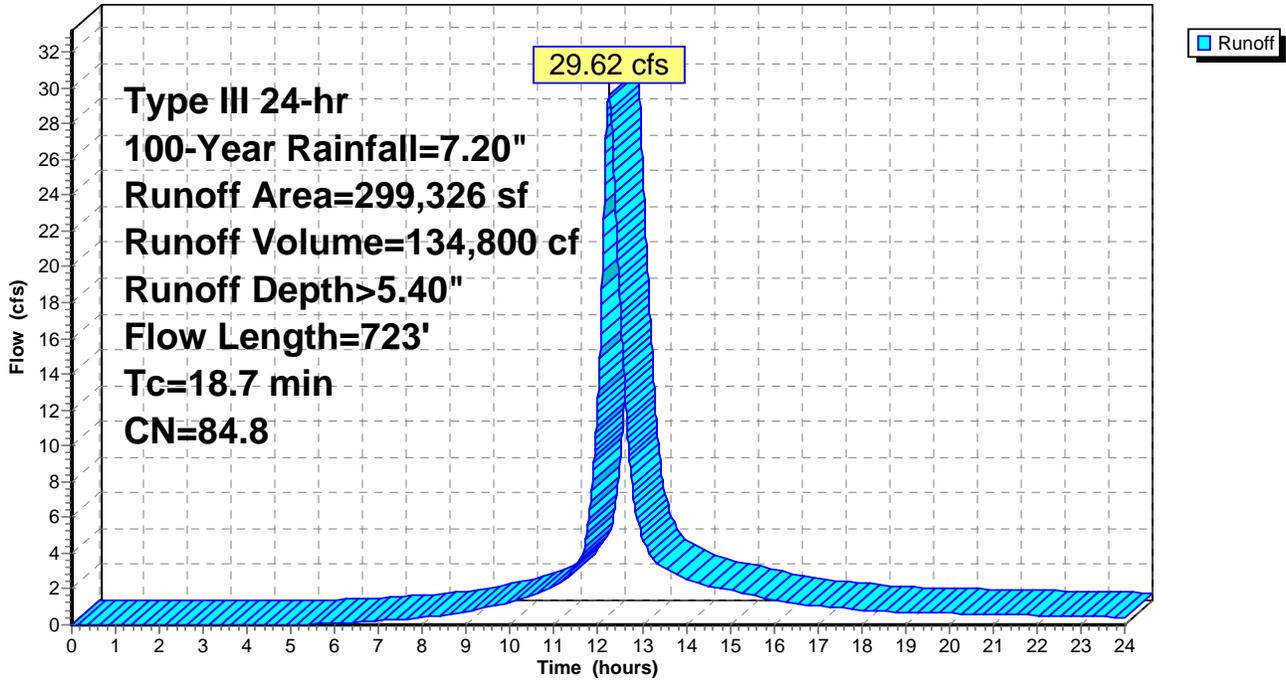
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=7.20"

Area (sf)	CN	Description
* 571	81.0	R 1/3-Acre Zone, HSG C
* 5,845	72.0	R 1/3-Acre Zone, HSG B
* 116,113	85.0	DMR Zone, HSG B
* 48,388	79.0	R 1/5-Acre Zone HSG B
* 85,157	86.0	R 1/5-Acre Zone, HSG C
* 12,877	92.0	DC Zone, HSG B
* 25,571	92.0	SB Zone, HSG B
* 681	98.0	On-site Impervious
* 4,123	69.0	On-site Pervious
299,326	84.8	Weighted Average
298,645		99.77% Pervious Area
681		0.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	178	0.0450	0.19		<b>Sheet Flow, 178 LF of Lawn Sheet</b> n= 0.240 P2= 3.40"
2.3	411	0.0390	2.96		<b>Shallow Concentrated Flow, 411 LF of Shallow Conc. Flow</b> Grassed Waterway Kv= 15.0 fps
0.5	134	0.0540	4.72		<b>Shallow Concentrated Flow, 134 LF of Shallow Conc. Flow</b> Paved Kv= 20.3 fps
18.7	723	Total			

Subcatchment CB#18: CB#18

Hydrograph



**Summary for Pond 150P: 42" Culvert Sump**

Inflow Area = 3,969,875 sf, 0.00% Impervious, Inflow Depth > 4.82" for 100-Year event  
 Inflow = 254.61 cfs @ 12.52 hrs, Volume= 1,594,818 cf  
 Outflow = 253.08 cfs @ 12.57 hrs, Volume= 1,594,402 cf, Atten= 1%, Lag= 2.9 min  
 Primary = 152.39 cfs @ 12.57 hrs, Volume= 325,847 cf  
 Secondary = 100.69 cfs @ 12.57 hrs, Volume= 1,268,555 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 86.17' @ 12.57 hrs Surf.Area= 27,707 sf Storage= 62,304 cf

Plug-Flow detention time= 3.0 min calculated for 1,594,402 cf (100% of inflow)  
 Center-of-Mass det. time= 2.9 min ( 836.9 - 834.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	79.70'	87,136 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.70	0	0	0
80.00	470	70	70
81.00	1,065	768	838
82.00	1,685	1,375	2,213
83.00	7,751	4,718	6,931
84.00	14,477	11,114	18,045
85.00	18,927	16,702	34,747
86.00	26,711	22,819	57,566
87.00	32,429	29,570	87,136

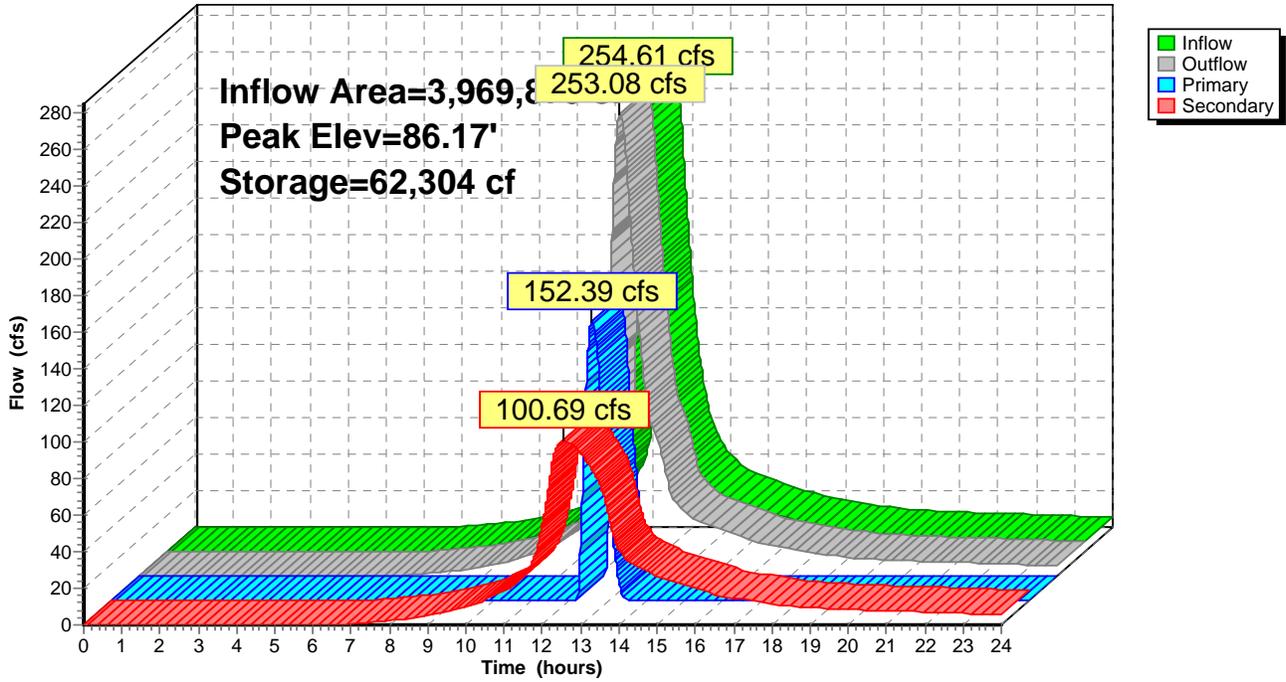
Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	<b>18.4' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	85.50'	<b>15.9' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	85.50'	<b>Asymmetrical Weir, C= 2.70</b> Offset (feet) 0.00 0.01 29.10 76.50 Height (feet) 1.50 0.00 0.50 1.50
#4	Secondary	79.70'	<b>42.0" Round Culvert from Wetland to CB#23</b> L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 79.70' / 76.70' S= 0.0254 1/1' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 9.62 sf

**Primary OutFlow** Max=152.25 cfs @ 12.57 hrs HW=86.17' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 105.22 cfs @ 3.42 fps)  
 2=Broad-Crested Rectangular Weir (Weir Controls 23.73 cfs @ 2.21 fps)  
 3=Asymmetrical Weir (Weir Controls 23.30 cfs @ 1.11 fps)

**Secondary OutFlow** Max=100.69 cfs @ 12.57 hrs HW=86.17' TW=79.23' (Fixed TW Elev= 79.23')  
 4=Culvert from Wetland to CB#23 (Inlet Controls 100.69 cfs @ 10.47 fps)

### Pond 150P: 42" Culvert Sump

Hydrograph



**Summary for Pond 155P: CB 36**

[57] Hint: Peaked at 90.50' (Flood elevation advised)

Inflow Area = 299,326 sf, 0.23% Impervious, Inflow Depth > 5.40" for 100-Year event  
 Inflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf  
 Outflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 22.19 cfs @ 12.24 hrs, Volume= 129,755 cf  
 Secondary = 7.43 cfs @ 12.24 hrs, Volume= 5,046 cf  
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 90.50' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Secondary	89.95'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	82.95'	<b>18.0" Round Culvert to CB#18</b> L= 89.6' Ke= 0.500 Inlet / Outlet Invert= 82.95' / 81.22' S= 0.0193 '/ Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Tertiary	90.60'	<b>6.0' long x 0.5' breadth EX CB#37 GRATE</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

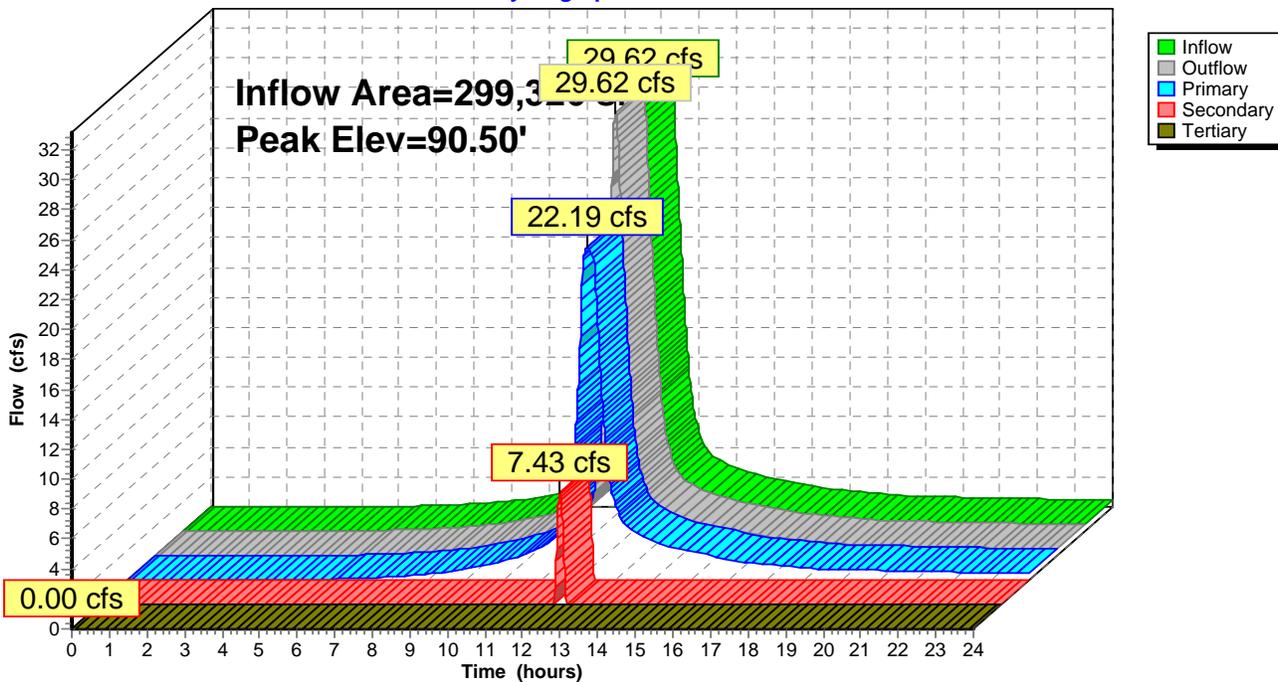
**Primary OutFlow** Max=22.18 cfs @ 12.24 hrs HW=90.50' (Free Discharge)  
 ↑2=Culvert to CB#18 (Inlet Controls 22.18 cfs @ 12.55 fps)

**Secondary OutFlow** Max=7.39 cfs @ 12.24 hrs HW=90.50' (Free Discharge)  
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 7.39 cfs @ 2.25 fps)

**Tertiary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=82.95' (Free Discharge)  
 ↑3=EX CB#37 GRATE ( Controls 0.00 cfs)

### Pond 155P: CB 36

Hydrograph



**Summary for Pond 163P: Proposed Catch Basin 18**

[57] Hint: Peaked at 79.44' (Flood elevation advised)

Inflow Area = 299,326 sf, 0.23% Impervious, Inflow Depth > 5.40" for 100-Year event  
 Inflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf  
 Outflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 25.91 cfs @ 12.24 hrs, Volume= 50,488 cf  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Tertiary = 3.71 cfs @ 11.60 hrs, Volume= 84,313 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 79.44' @ 12.24 hrs

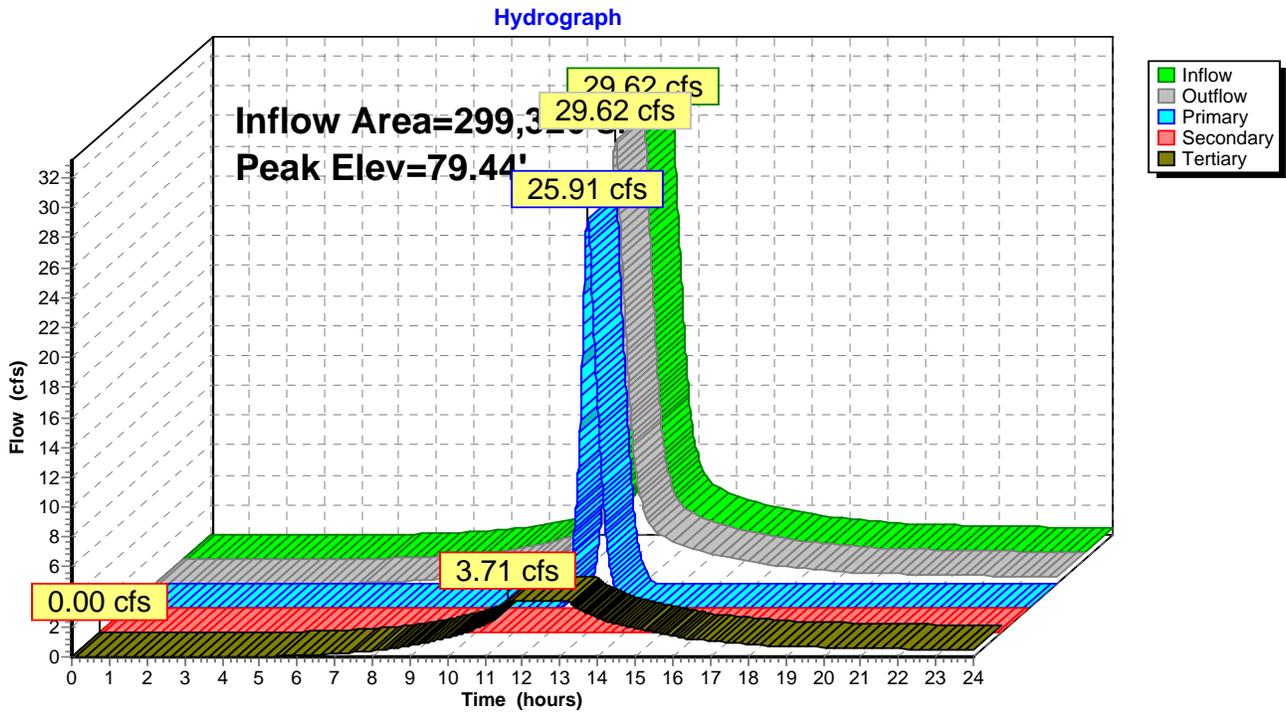
Device	Routing	Invert	Outlet Devices
#1	Secondary	86.00'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	75.00'	<b>24.0" Round Culvert to JV #3</b> L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 75.00' / 71.00' S= 0.2667 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#3	Tertiary	75.00'	<b>3.710 cfs Flow Bypassing CB18 Grate</b>

**Primary OutFlow** Max=25.89 cfs @ 12.24 hrs HW=79.44' TW=76.51' (Fixed TW Elev= 76.51')  
 ↳2=Culvert to JV #3 (Inlet Controls 25.89 cfs @ 8.24 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=75.00' (Free Discharge)  
 ↳1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Tertiary OutFlow** Max=3.71 cfs @ 11.60 hrs HW=76.51' (Free Discharge)  
 ↳3=Flow Bypassing CB18 Grate (Constant Controls 3.71 cfs)

### Pond 163P: Proposed Catch Basin 18



**Summary for Pond 164P: Existing West Ave. Ponding**

Inflow Area = 4,065,412 sf, 0.00% Impervious, Inflow Depth > 1.09" for 100-Year event  
 Inflow = 156.26 cfs @ 12.57 hrs, Volume= 370,956 cf  
 Outflow = 156.25 cfs @ 12.57 hrs, Volume= 370,952 cf, Atten= 0%, Lag= 0.2 min  
 Primary = 136.12 cfs @ 12.57 hrs, Volume= 274,739 cf  
 Secondary = 20.13 cfs @ 12.57 hrs, Volume= 96,213 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 83.08' @ 12.57 hrs Surf.Area= 4,779 sf Storage= 2,522 cf

Plug-Flow detention time= 0.4 min calculated for 370,952 cf (100% of inflow)  
 Center-of-Mass det. time= 0.4 min ( 764.9 - 764.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	81.96'	10,214 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.96	0	0	0
83.00	4,186	2,177	2,177
84.00	11,889	8,038	10,214

Device	Routing	Invert	Outlet Devices
#1	Primary	82.42'	<b>Asymmetrical Weir, C= 2.70</b> Offset (feet) 0.00 37.17 57.80 77.63 115.63 144.17 153.17 206.01 242.47 Height (feet) 1.31 0.60 0.39 0.21 0.06 0.00 0.03 0.60 1.31
#2	Secondary	81.96'	<b>EX. CB. #31</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.100 5.400 6.600 7.700 8.700 9.400 10.000 10.300
#3	Device 4	82.05'	<b>EX. CB #32</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.100 5.400 6.600 7.700 8.700 9.400 10.000 10.300
#4	Secondary	80.00'	<b>12.0" Round Pipe From EX. CB #32</b> L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 80.00' / 79.89' S= 0.0022 '/ Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#5	Device 6	82.46'	<b>EX. CB. #30</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.100 5.400 6.600 7.700 8.700 9.400 10.000 10.300
#6	Secondary	80.38'	<b>12.0" Round Pipe from EX CB 30</b> L= 74.0' Ke= 0.500 Inlet / Outlet Invert= 80.38' / 79.90' S= 0.0065 '/ Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf

Primary OutFlow Max=136.08 cfs @ 12.57 hrs HW=83.08' (Free Discharge)

1=Asymmetrical Weir (Weir Controls 136.08 cfs @ 1.43 fps)

Secondary OutFlow Max=20.13 cfs @ 12.57 hrs HW=83.08' (Free Discharge)

2=EX. CB. #31 (Custom Controls 10.05 cfs)

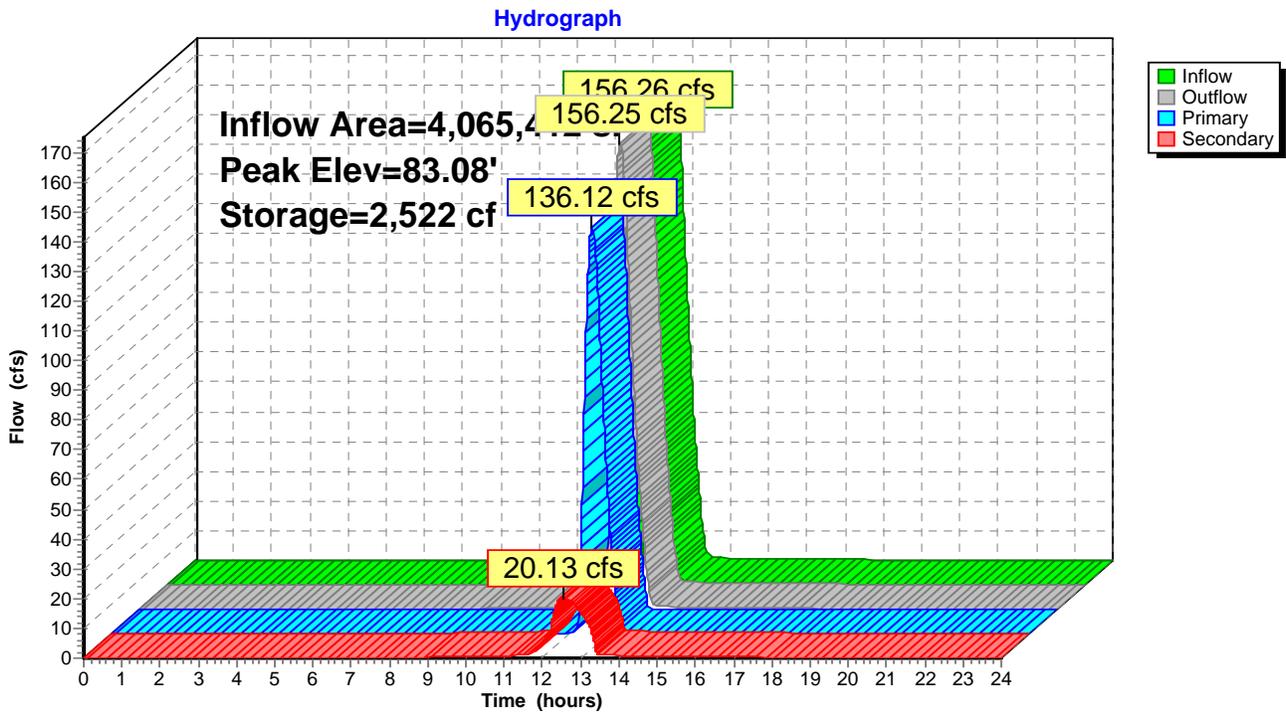
4=Pipe From EX. CB #32 (Barrel Controls 5.32 cfs @ 6.77 fps)

3=EX. CB #32 (Passes 5.32 cfs of 9.56 cfs potential flow)

6=Pipe from EX CB 30 (Barrel Controls 4.76 cfs @ 6.06 fps)

5=EX. CB. #30 (Passes 4.76 cfs of 5.60 cfs potential flow)

### Pond 164P: Existing West Ave. Ponding



**Summary for Pond 165P: 42" Culvert Sump**

Inflow Area = 3,969,875 sf, 0.00% Impervious, Inflow Depth > 4.82" for 100-Year event  
 Inflow = 254.61 cfs @ 12.52 hrs, Volume= 1,594,818 cf  
 Outflow = 253.08 cfs @ 12.57 hrs, Volume= 1,594,402 cf, Atten= 1%, Lag= 2.9 min  
 Primary = 152.39 cfs @ 12.57 hrs, Volume= 325,847 cf  
 Secondary = 100.69 cfs @ 12.57 hrs, Volume= 1,268,555 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 86.17' @ 12.57 hrs Surf.Area= 27,707 sf Storage= 62,304 cf

Plug-Flow detention time= 3.0 min calculated for 1,594,402 cf (100% of inflow)  
 Center-of-Mass det. time= 2.9 min ( 836.9 - 834.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	79.70'	87,136 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.70	0	0	0
80.00	470	70	70
81.00	1,065	768	838
82.00	1,685	1,375	2,213
83.00	7,751	4,718	6,931
84.00	14,477	11,114	18,045
85.00	18,927	16,702	34,747
86.00	26,711	22,819	57,566
87.00	32,429	29,570	87,136

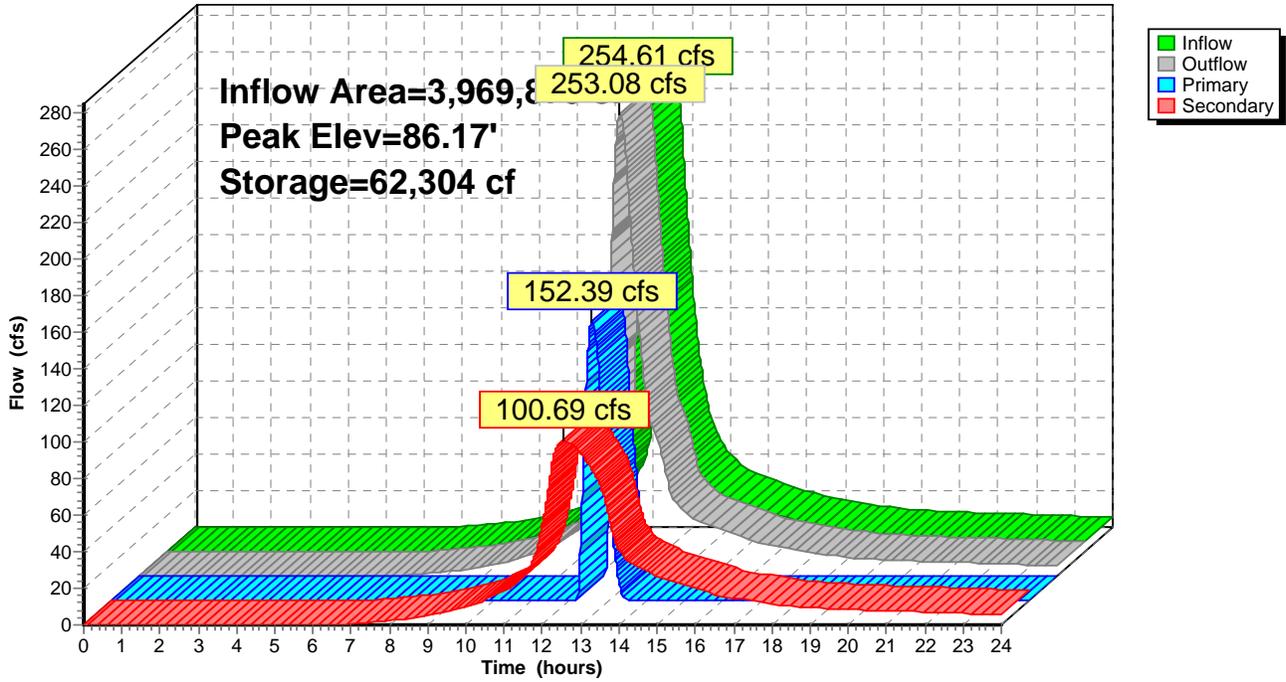
Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	<b>18.4' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	85.50'	<b>15.9' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	85.50'	<b>Asymmetrical Weir, C= 2.70</b> Offset (feet) 0.00 0.01 29.10 76.50 Height (feet) 1.50 0.00 0.50 1.50
#4	Secondary	79.70'	<b>42.0" Round Culvert from Wetland to CB#23</b> L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 79.70' / 76.70' S= 0.0254 1/1' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 9.62 sf

**Primary OutFlow** Max=152.25 cfs @ 12.57 hrs HW=86.17' (Free Discharge)  
 1=Broad-Crested Rectangular Weir (Weir Controls 105.22 cfs @ 3.42 fps)  
 2=Broad-Crested Rectangular Weir (Weir Controls 23.73 cfs @ 2.21 fps)  
 3=Asymmetrical Weir (Weir Controls 23.30 cfs @ 1.11 fps)

**Secondary OutFlow** Max=100.69 cfs @ 12.57 hrs HW=86.17' TW=79.23' (Fixed TW Elev= 79.23')  
 4=Culvert from Wetland to CB#23 (Inlet Controls 100.69 cfs @ 10.47 fps)

### Pond 165P: 42" Culvert Sump

Hydrograph



**Summary for Pond 166P: CB 36**

[57] Hint: Peaked at 90.50' (Flood elevation advised)

Inflow Area = 299,326 sf, 0.23% Impervious, Inflow Depth > 5.40" for 100-Year event  
 Inflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf  
 Outflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 22.19 cfs @ 12.24 hrs, Volume= 129,755 cf  
 Secondary = 7.43 cfs @ 12.24 hrs, Volume= 5,046 cf  
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 90.50' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Secondary	89.95'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	82.95'	<b>18.0" Round Culvert to CB#18</b> L= 89.6' Ke= 0.500 Inlet / Outlet Invert= 82.95' / 81.22' S= 0.0193 '/ Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Tertiary	90.60'	<b>6.0' long x 0.5' breadth EX CB#37 GRATE</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

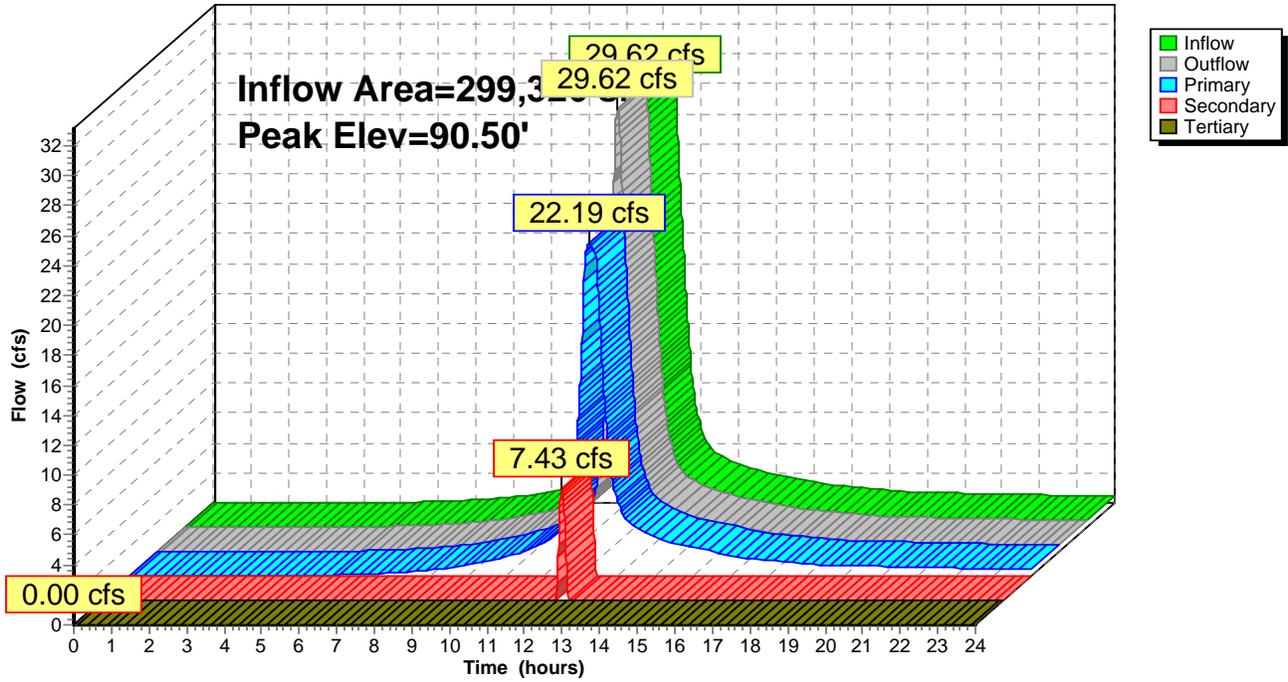
**Primary OutFlow** Max=22.18 cfs @ 12.24 hrs HW=90.50' (Free Discharge)  
 ↑2=Culvert to CB#18 (Inlet Controls 22.18 cfs @ 12.55 fps)

**Secondary OutFlow** Max=7.39 cfs @ 12.24 hrs HW=90.50' (Free Discharge)  
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 7.39 cfs @ 2.25 fps)

**Tertiary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=82.95' (Free Discharge)  
 ↑3=EX CB#37 GRATE ( Controls 0.00 cfs)

### Pond 166P: CB 36

Hydrograph



### Summary for Pond 167P: EX-CB 36

[57] Hint: Peaked at 90.64' (Flood elevation advised)

Inflow Area = 299,326 sf, 0.23% Impervious, Inflow Depth > 5.40" for 100-Year event  
 Inflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf  
 Outflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 18.44 cfs @ 12.24 hrs, Volume= 125,147 cf  
 Secondary = 10.99 cfs @ 12.24 hrs, Volume= 9,606 cf  
 Tertiary = 0.19 cfs @ 12.24 hrs, Volume= 48 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 90.64' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Secondary	89.95'	<b>6.0' long x 0.5' breadth EX CB#36 Grate</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	82.95'	<b>18.0" Round Culvert to EX CB#33</b> L= 314.0' Ke= 0.500 Inlet / Outlet Invert= 82.95' / 76.90' S= 0.0193 1/1' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Tertiary	90.60'	<b>6.0' long x 0.5' breadth EX CB#37</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

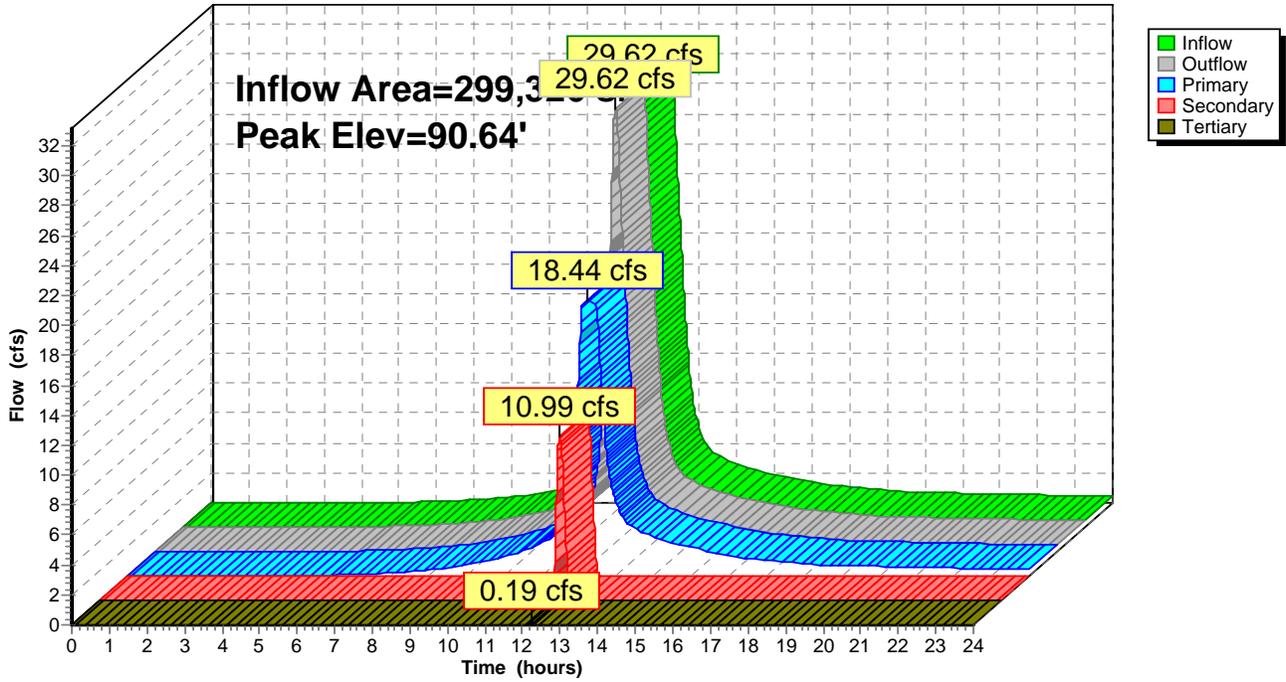
**Primary OutFlow** Max=18.44 cfs @ 12.24 hrs HW=90.64' (Free Discharge)  
 ↑**2=Culvert to EX CB#33** (Barrel Controls 18.44 cfs @ 10.43 fps)

**Secondary OutFlow** Max=10.95 cfs @ 12.24 hrs HW=90.64' (Free Discharge)  
 ↑**1=EX CB#36 Grate** (Weir Controls 10.95 cfs @ 2.64 fps)

**Tertiary OutFlow** Max=0.14 cfs @ 12.24 hrs HW=90.64' (Free Discharge)  
 ↑**3=EX CB#37** (Weir Controls 0.14 cfs @ 0.56 fps)

### Pond 167P: EX-CB 36

Hydrograph



**Summary for Pond 168P: Proposed Catch Basin 18**

[57] Hint: Peaked at 79.44' (Flood elevation advised)

Inflow Area = 299,326 sf, 0.23% Impervious, Inflow Depth > 5.40" for 100-Year event  
 Inflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf  
 Outflow = 29.62 cfs @ 12.24 hrs, Volume= 134,800 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 25.91 cfs @ 12.24 hrs, Volume= 50,488 cf  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Tertiary = 3.71 cfs @ 11.60 hrs, Volume= 84,313 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 79.44' @ 12.24 hrs

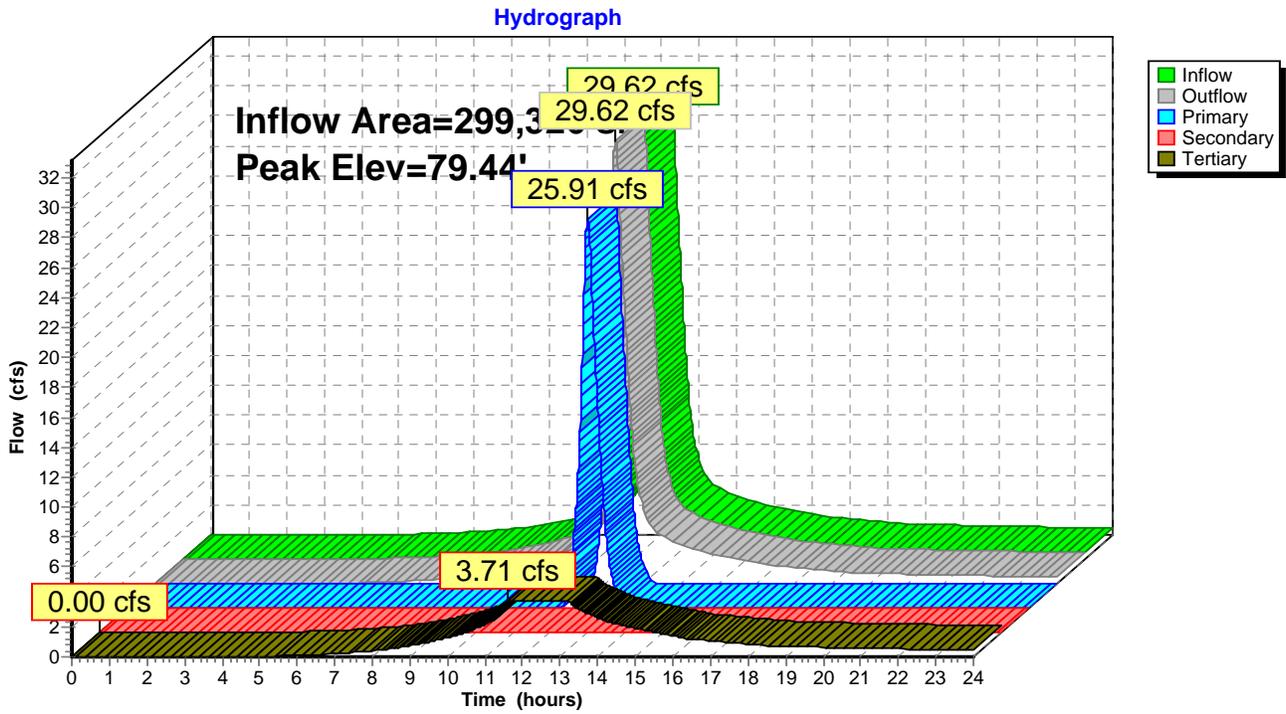
Device	Routing	Invert	Outlet Devices
#1	Secondary	86.00'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	75.00'	<b>24.0" Round Culvert to JV #3</b> L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 75.00' / 71.00' S= 0.2667 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#3	Tertiary	75.00'	<b>3.710 cfs Flow Bypassing CB18 Grate</b>

**Primary OutFlow** Max=25.89 cfs @ 12.24 hrs HW=79.44' TW=76.51' (Fixed TW Elev= 76.51')  
 ↳2=Culvert to JV #3 (Inlet Controls 25.89 cfs @ 8.24 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=75.00' (Free Discharge)  
 ↳1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Tertiary OutFlow** Max=3.71 cfs @ 11.60 hrs HW=76.51' (Free Discharge)  
 ↳3=Flow Bypassing CB18 Grate (Constant Controls 3.71 cfs)

### Pond 168P: Proposed Catch Basin 18



**Summary for Pond 171P: 42" Culvert Sump**

Inflow Area = 3,969,875 sf, 0.00% Impervious, Inflow Depth > 4.82" for 100-Year event  
 Inflow = 254.61 cfs @ 12.52 hrs, Volume= 1,594,818 cf  
 Outflow = 253.08 cfs @ 12.57 hrs, Volume= 1,594,402 cf, Atten= 1%, Lag= 2.9 min  
 Primary = 152.39 cfs @ 12.57 hrs, Volume= 325,847 cf  
 Secondary = 100.69 cfs @ 12.57 hrs, Volume= 1,268,555 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 86.17' @ 12.57 hrs Surf.Area= 27,707 sf Storage= 62,304 cf

Plug-Flow detention time= 3.0 min calculated for 1,594,402 cf (100% of inflow)  
 Center-of-Mass det. time= 2.9 min ( 836.9 - 834.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	79.70'	87,136 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.70	0	0	0
80.00	470	70	70
81.00	1,065	768	838
82.00	1,685	1,375	2,213
83.00	7,751	4,718	6,931
84.00	14,477	11,114	18,045
85.00	18,927	16,702	34,747
86.00	26,711	22,819	57,566
87.00	32,429	29,570	87,136

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	<b>18.4' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	85.50'	<b>15.9' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	85.50'	<b>Asymmetrical Weir, C= 2.70</b> Offset (feet) 0.00 0.01 29.10 76.50 Height (feet) 1.50 0.00 0.50 1.50
#4	Device 5	79.70'	<b>42.0" Round Culvert from Wetland to EX STM MH #14</b> L= 113.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 79.70' / 76.80' S= 0.0257 '/ Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 9.62 sf
#5	Secondary	76.80'	<b>48.0" W x 48.0" H Box Culvert from EX STM MH #14 to EX STM MH #13</b> L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 76.80' / 75.90' S= 0.0200 '/ Cc= 0.900 n= 0.013, Flow Area= 16.00 sf

Primary OutFlow Max=152.25 cfs @ 12.57 hrs HW=86.17' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 105.22 cfs @ 3.42 fps)

2=Broad-Crested Rectangular Weir (Weir Controls 23.73 cfs @ 2.21 fps)

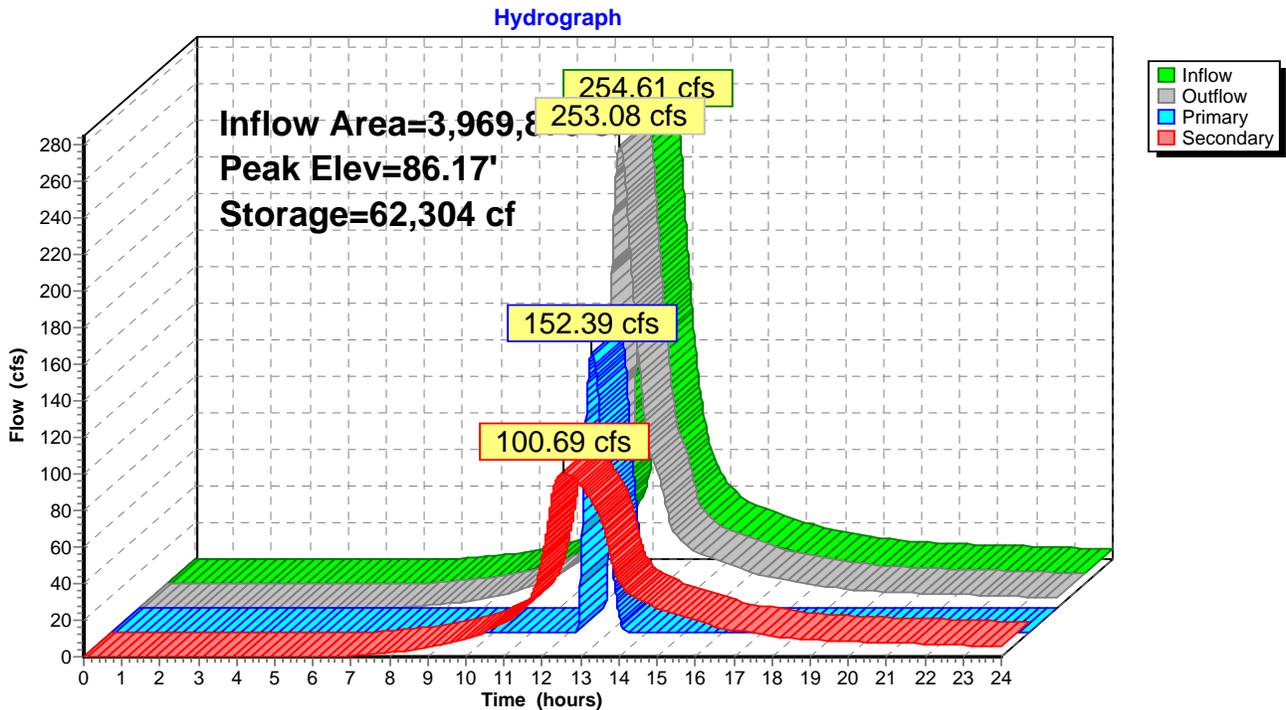
3=Asymmetrical Weir (Weir Controls 23.30 cfs @ 1.11 fps)

Secondary OutFlow Max=100.69 cfs @ 12.57 hrs HW=86.17' TW=75.42' (Fixed TW Elev= 75.42')

5=Culvert from EX STM MH #14 to EX STM MH #13(Passes 100.69 cfs of 208.55 cfs potential flow)

4=Culvert from Wetland to EX STM MH #14(Inlet Controls 100.69 cfs @ 10.47 fps)

### Pond 171P: 42" Culvert Sump



**Summary for Pond 177P: West Ave. - 50% Clog**

[81] Warning: Exceeded Pond 163P by 7.27' @ 13.25 hrs

Inflow Area = 4,075,668 sf, 0.06% Impervious, Inflow Depth > 1.35" for 100-Year event  
 Inflow = 160.34 cfs @ 12.56 hrs, Volume= 458,947 cf  
 Outflow = 158.57 cfs @ 12.61 hrs, Volume= 458,837 cf, Atten= 1%, Lag= 2.6 min  
 Primary = 158.57 cfs @ 12.61 hrs, Volume= 458,837 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 83.31' @ 12.61 hrs Surf.Area= 11,445 sf Storage= 7,575 cf

Plug-Flow detention time= 0.8 min calculated for 458,837 cf (100% of inflow)  
 Center-of-Mass det. time= 0.7 min ( 780.3 - 779.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	81.35'	17,941 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.35	0	0	0
82.00	495	161	161
83.00	8,236	4,366	4,526
84.00	18,593	13,415	17,941

Device	Routing	Invert	Outlet Devices
#1	Device 12	81.67'	<b>CB#19</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.700 6.700 8.700 10.700 12.700 14.500 16.200 17.600 18.900 19.900 20.600 21.300 21.900 22.600 23.200 23.800
#2	Device 12	81.70'	<b>CB#20</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.700 6.700 8.700 10.700 12.700 14.500 16.200 17.600 18.900 19.900 20.600 21.300 21.900 22.600 23.200 23.800
#3	Device 12	81.74'	<b>CB#21</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.700 6.700 8.700 10.700 12.700 14.500 16.200 17.600 18.900 19.900 20.600 21.300 21.900 22.600 23.200 23.800
#4	Primary	81.86'	<b>CB#22</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.700 6.700 8.700 10.700 12.700 14.500 16.200 17.600 18.900 19.900 20.600 21.300 21.900 22.600 23.200 23.800
#5	Primary	81.82'	<b>CB#23</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90

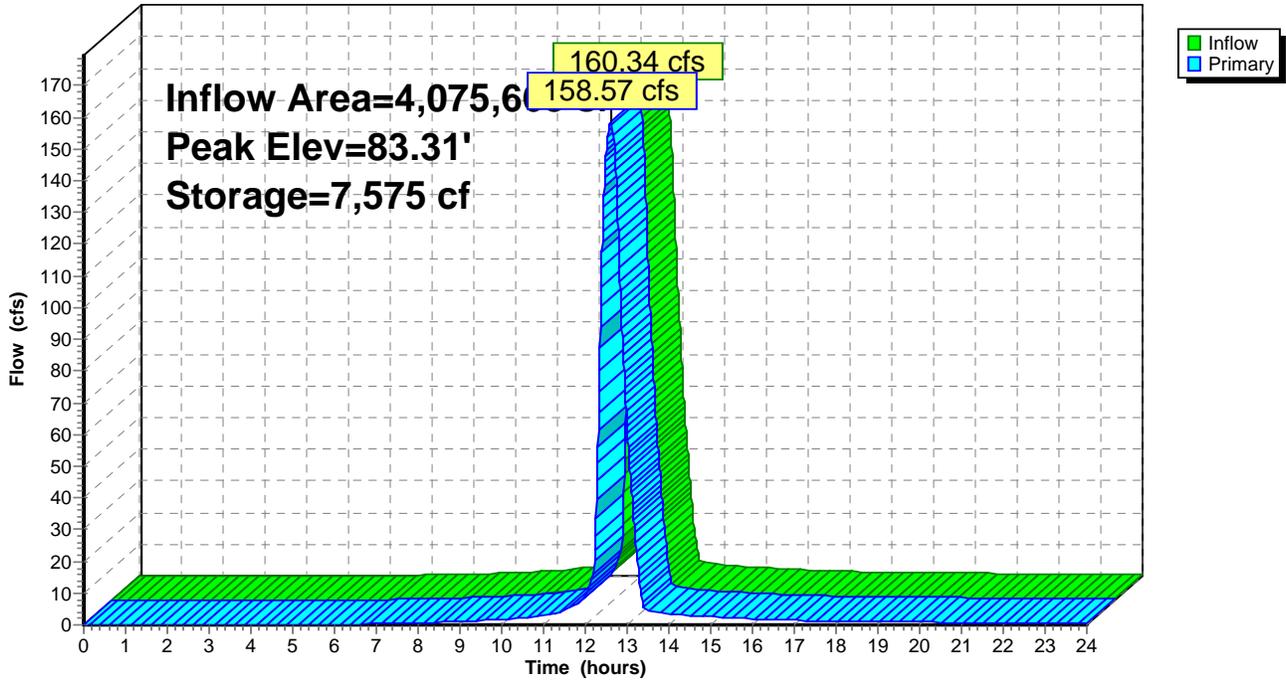
			1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	
			Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.700 6.700 8.700											
			10.700 12.700 14.500 16.200 17.600 18.900 19.900 20.600											
			21.300 21.900 22.600 23.200 23.800											
#6	Primary	81.79'	<b>CB#24</b>											
			Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90											
			1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00											
			Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.700 6.700 8.700											
			10.700 12.700 14.500 16.200 17.600 18.900 19.900 20.600											
			21.300 21.900 22.600 23.200 23.800											
#7	Device 8	82.05'	<b>EX. CB#32</b>											
			Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90											
			1.00 1.10 1.20 1.30 1.40											
			Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.100 5.400 6.600											
			7.700 8.700 9.400 10.000 10.300 10.600 10.900											
#8	Primary	80.00'	<b>12.0" Round Pipe From EX. CB#32</b> L= 27.6' Ke= 0.500											
			Inlet / Outlet Invert= 80.00' / 79.94' S= 0.0022 '/ Cc= 0.900											
			n= 0.013, Flow Area= 0.79 sf											
#9	Device 10	82.46'	<b>EX. CB#30</b>											
			Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90											
			1.00 1.10 1.20											
			Disch. (cfs) 0.000 0.300 1.000 1.800 2.800 4.100 5.400 6.600											
			7.700 8.700 9.400 10.000 10.300											
#10	Primary	80.38'	<b>12.0" Round Pipe From EX. CB#30</b> L= 57.5' Ke= 0.500											
			Inlet / Outlet Invert= 80.38' / 80.00' S= 0.0066 '/ Cc= 0.900											
			n= 0.013, Flow Area= 0.79 sf											
#11	Device 12	82.03'	<b>4.8' long x 0.5' breadth Broad-Crested Rectangular Weir</b>											
			Head (feet) 0.20 0.40 0.60 0.80 1.00											
			Coef. (English) 2.80 2.92 3.08 3.30 3.32											
#12	Primary	82.42'	<b>West Avenue Centerline, C= 2.70</b>											
			Offset (feet) 0.00 37.17 57.80 77.63 115.63 144.17 153.17											
			206.01 242.47											
			Height (feet) 1.31 0.60 0.39 0.21 0.06 0.00 0.03 0.60 1.31											

Primary OutFlow Max=158.56 cfs @ 12.61 hrs HW=83.31' TW=79.25' (Fixed TW Elev= 79.25')

- 4=CB#22 (Custom Controls 20.25 cfs)
- 5=CB#23 (Custom Controls 20.53 cfs)
- 6=CB#24 (Custom Controls 20.74 cfs)
- 8=Pipe From EX. CB#32 (Barrel Controls 6.31 cfs @ 8.03 fps)
- 7=EX. CB#32 (Passes 6.31 cfs of 10.48 cfs potential flow)
- 10=Pipe From EX. CB#30 (Barrel Controls 5.27 cfs @ 6.71 fps)
- 9=EX. CB#30 (Passes 5.27 cfs of 8.20 cfs potential flow)
- 12=West Avenue Centerline (Passes 85.47 cfs of 256.01 cfs potential flow)
- 1=CB#19 (Custom Controls 21.54 cfs)
- 2=CB#20 (Custom Controls 21.36 cfs)
- 3=CB#21 (Custom Controls 21.09 cfs)
- 11=Broad-Crested Rectangular Weir (Weir Controls 21.49 cfs @ 3.50 fps)

### Pond 177P: West Ave. - 50% Clog

Hydrograph



**Summary for Pond 178P: West Ave. - No Clog**

[81] Warning: Exceeded Pond 168P by 7.12' @ 13.25 hrs

Inflow Area = 4,075,668 sf, 0.06% Impervious, Inflow Depth > 1.35" for 100-Year event  
 Inflow = 160.34 cfs @ 12.56 hrs, Volume= 458,947 cf  
 Outflow = 160.31 cfs @ 12.57 hrs, Volume= 458,854 cf, Atten= 0%, Lag= 0.3 min  
 Primary = 160.31 cfs @ 12.57 hrs, Volume= 458,854 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 82.87' @ 12.57 hrs Surf.Area= 7,211 sf Storage= 3,504 cf

Plug-Flow detention time= 0.6 min calculated for 458,662 cf (100% of inflow)  
 Center-of-Mass det. time= 0.4 min ( 780.1 - 779.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	81.35'	17,941 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.35	0	0	0
82.00	495	161	161
83.00	8,236	4,366	4,526
84.00	18,593	13,415	17,941

Device	Routing	Invert	Outlet Devices
#1	Device 12	81.67'	<b>CB#19</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 Disch. (cfs) 0.000 0.700 2.000 3.600 5.600 9.400 13.400 17.500 21.500 25.400 29.000 32.300 35.300 37.800 39.800
#2	Device 12	81.70'	<b>CB#20</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 Disch. (cfs) 0.000 0.700 2.000 3.600 5.600 9.400 13.400 17.500 21.500 25.400 29.000 32.300 35.300 37.800 39.800
#3	Device 12	81.74'	<b>CB#21</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 Disch. (cfs) 0.000 0.700 2.000 3.600 5.600 9.400 13.400 17.500 21.500 25.400 29.000 32.300 35.300 37.800 39.800
#4	Primary	81.86'	<b>CB#22</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 Disch. (cfs) 0.000 0.700 2.000 3.600 5.600 9.400 13.400 17.500 21.500 25.400 29.000 32.300 35.300 37.800 39.800
#5	Primary	81.82'	<b>CB#23</b> Head (feet) 0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 Disch. (cfs) 0.000 0.700 2.000 3.600 5.600 9.400 13.400 17.500 21.500 25.400 29.000 32.300 35.300 37.800 39.800
#6	Primary	81.79'	<b>CB#24</b>

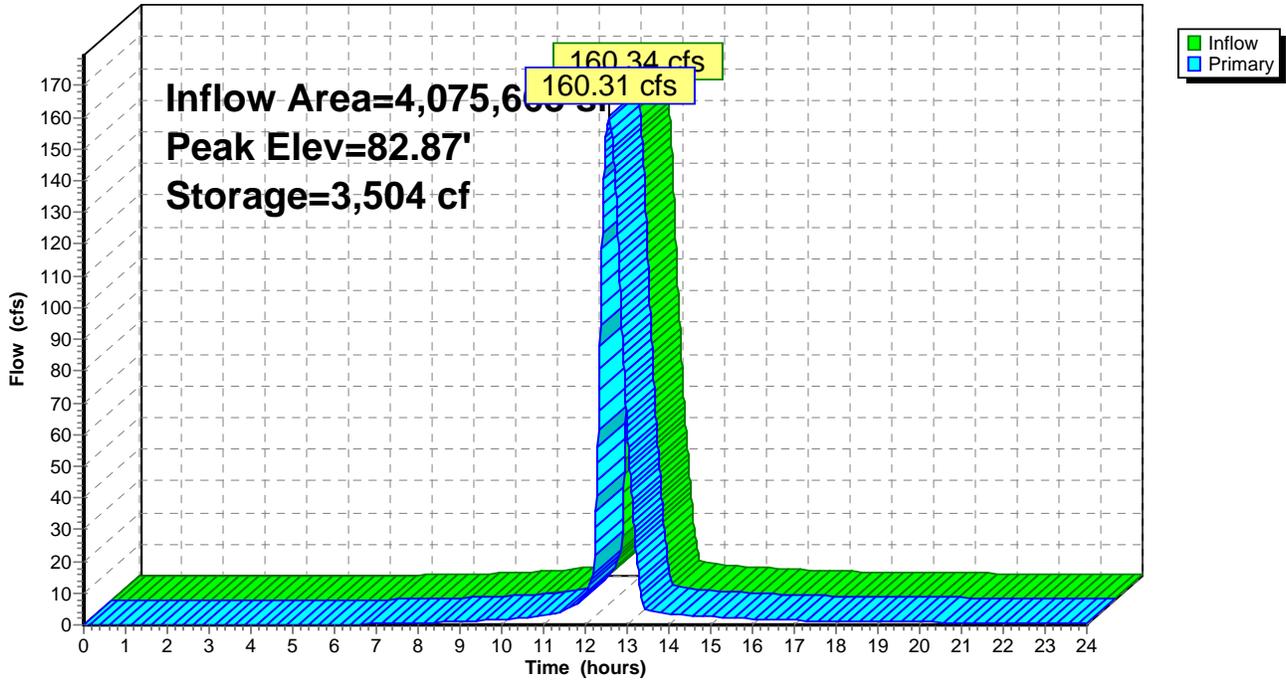
			Head (feet)	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
				1.00	1.10	1.20	1.30	1.40					
			Disch. (cfs)	0.000	0.700	2.000	3.600	5.600	9.400	13.400	17.500		
				21.500	25.400	29.000	32.300	35.300	37.800	39.800			
#7	Device 8	82.05'	<b>EX. CB#32</b>										
			Head (feet)	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
				1.00	1.10	1.20							
			Disch. (cfs)	0.000	0.300	1.000	1.800	2.800	4.100	5.400	6.600		
				7.700	8.700	9.400	10.000	10.300					
#8	Primary	80.00'	<b>12.0" Round Pipe From EX CB#32</b>	L= 27.6' Ke= 0.500									
			Inlet / Outlet Invert=	80.00' / 79.94' S= 0.0022 '/ Cc= 0.900									
			n=	0.013, Flow Area= 0.79 sf									
#9	Device 10	82.46'	<b>EX. CB#30</b>										
			Head (feet)	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
				1.00	1.10	1.20							
			Disch. (cfs)	0.000	0.300	1.000	1.800	2.800	4.100	5.400	6.600		
				7.700	8.700	9.400	10.000	10.300					
#10	Primary	80.38'	<b>12.0" Round Pipe From EX. CB#30</b>	L= 57.5' Ke= 0.500									
			Inlet / Outlet Invert=	80.38' / 80.00' S= 0.0066 '/ Cc= 0.900									
			n=	0.013, Flow Area= 0.79 sf									
#11	Device 12	82.03'	<b>9.7' long x 0.5' breadth Broad-Crested Rectangular Weir</b>										
			Head (feet)	0.20	0.40	0.60	0.80	1.00					
			Coef. (English)	2.80	2.92	3.08	3.30	3.32					
#12	Primary	82.42'	<b>West Avenue Centerline, C= 2.70</b>										
			Offset (feet)	0.00	37.17	57.80	77.63	115.63	144.17	153.17			
				206.01	242.47								
			Height (feet)	1.31	0.60	0.39	0.21	0.06	0.00	0.03	0.60	1.31	

**Primary OutFlow** Max=160.30 cfs @ 12.57 hrs HW=82.87' TW=79.25' (Fixed TW Elev= 79.25')

- 4=CB#22 (Custom Controls 29.25 cfs)
- 5=CB#23 (Custom Controls 30.57 cfs)
- 6=CB#24 (Custom Controls 31.56 cfs)
- 8=Pipe From EX CB#32 (Barrel Controls 5.69 cfs @ 7.24 fps)
- 7=EX. CB#32 (Passes 5.69 cfs of 7.88 cfs potential flow)
- 10=Pipe From EX. CB#30 (Passes 2.90 cfs of 4.74 cfs potential flow)
- 9=EX. CB#30 (Custom Controls 2.90 cfs)
- 12=West Avenue Centerline (Weir Controls 60.33 cfs @ 1.14 fps)
- 1=CB#19 (Passes < 35.23 cfs potential flow)
- 2=CB#20 (Passes < 34.33 cfs potential flow)
- 3=CB#21 (Passes < 33.13 cfs potential flow)
- 11=Broad-Crested Rectangular Weir (Passes < 21.20 cfs potential flow)

### Pond 178P: West Ave. - No Clog

Hydrograph



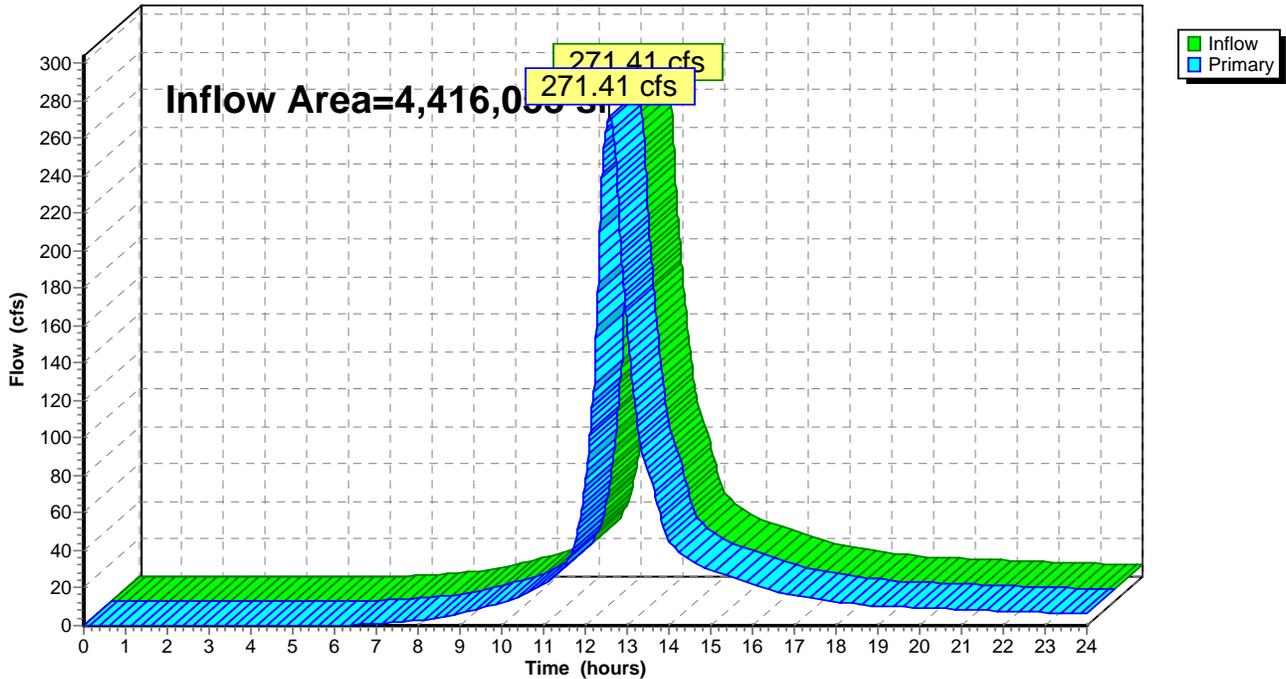
### Summary for Link 154L: Detention

Inflow Area = 4,416,053 sf, 0.90% Impervious, Inflow Depth > 4.89" for 100-Year event  
Inflow = 271.41 cfs @ 12.58 hrs, Volume= 1,800,297 cf  
Primary = 271.41 cfs @ 12.58 hrs, Volume= 1,800,297 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link 154L: Detention

Hydrograph



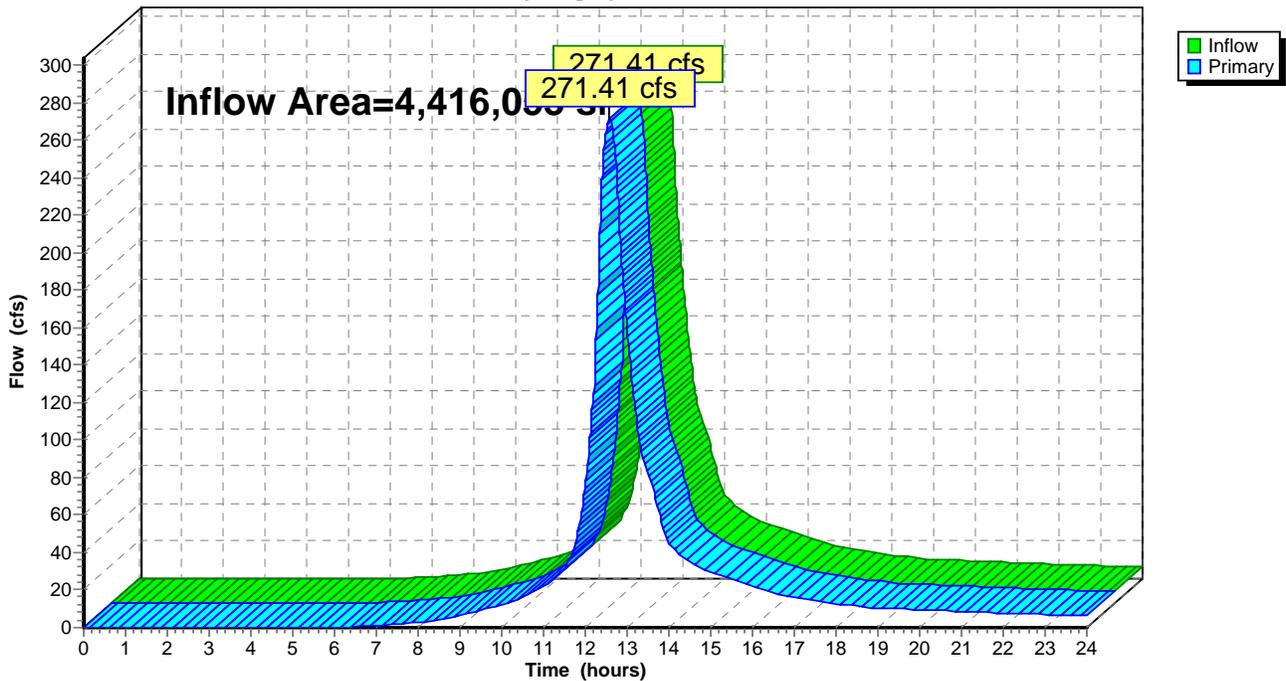
### Summary for Link 156L: Culvert

Inflow Area = 4,416,053 sf, 0.90% Impervious, Inflow Depth > 4.89" for 100-Year event  
Inflow = 271.41 cfs @ 12.58 hrs, Volume= 1,800,297 cf  
Primary = 271.41 cfs @ 12.58 hrs, Volume= 1,800,297 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link 156L: Culvert

Hydrograph



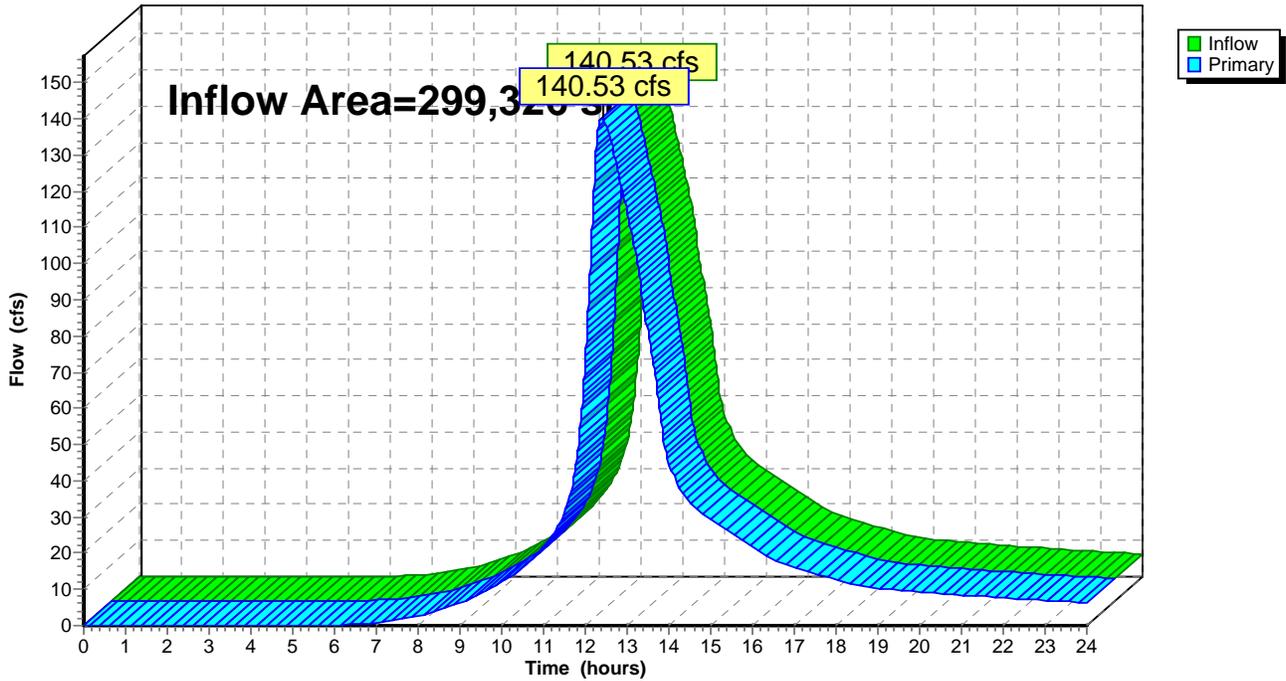
### Summary for Link 169L: Culvert

Inflow Area = 299,326 sf, 0.23% Impervious, Inflow Depth > 60.12" for 100-Year event  
Inflow = 140.53 cfs @ 12.41 hrs, Volume= 1,499,521 cf  
Primary = 140.53 cfs @ 12.41 hrs, Volume= 1,499,521 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link 169L: Culvert

Hydrograph



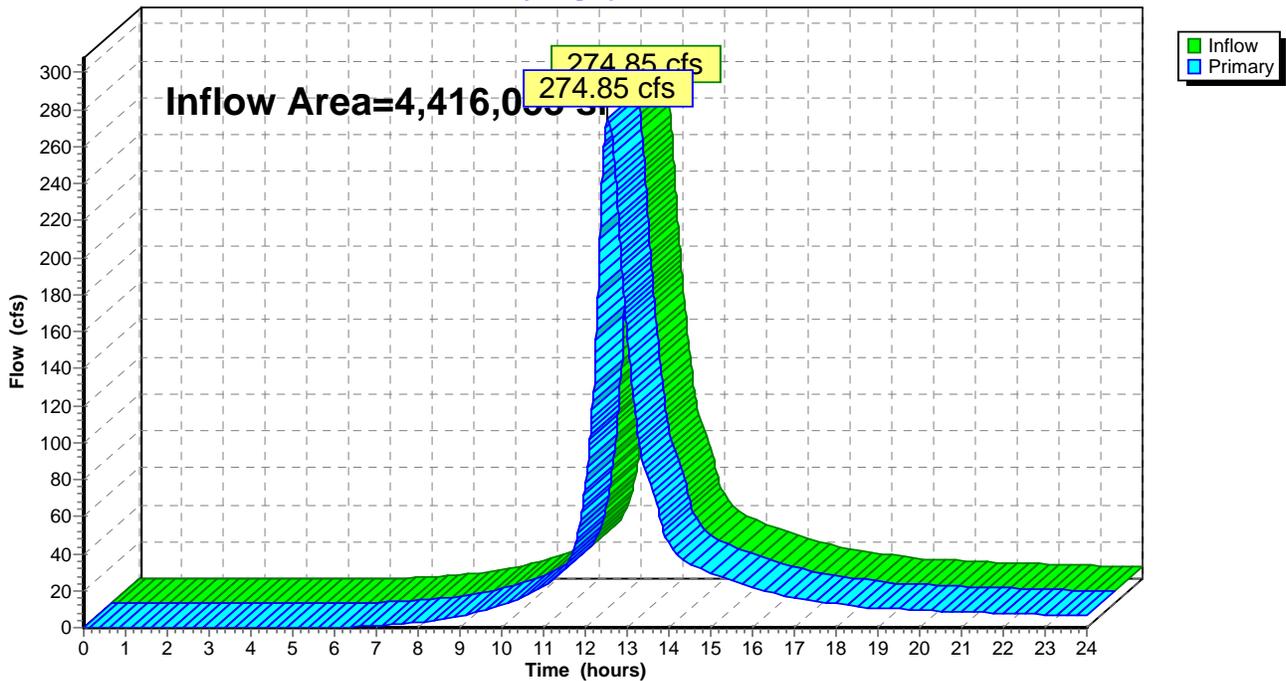
### Summary for Link 170L: Detention

Inflow Area = 4,416,053 sf, 0.90% Impervious, Inflow Depth > 4.89" for 100-Year event  
Inflow = 274.85 cfs @ 12.55 hrs, Volume= 1,800,313 cf  
Primary = 274.85 cfs @ 12.55 hrs, Volume= 1,800,313 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link 170L: Detention

Hydrograph



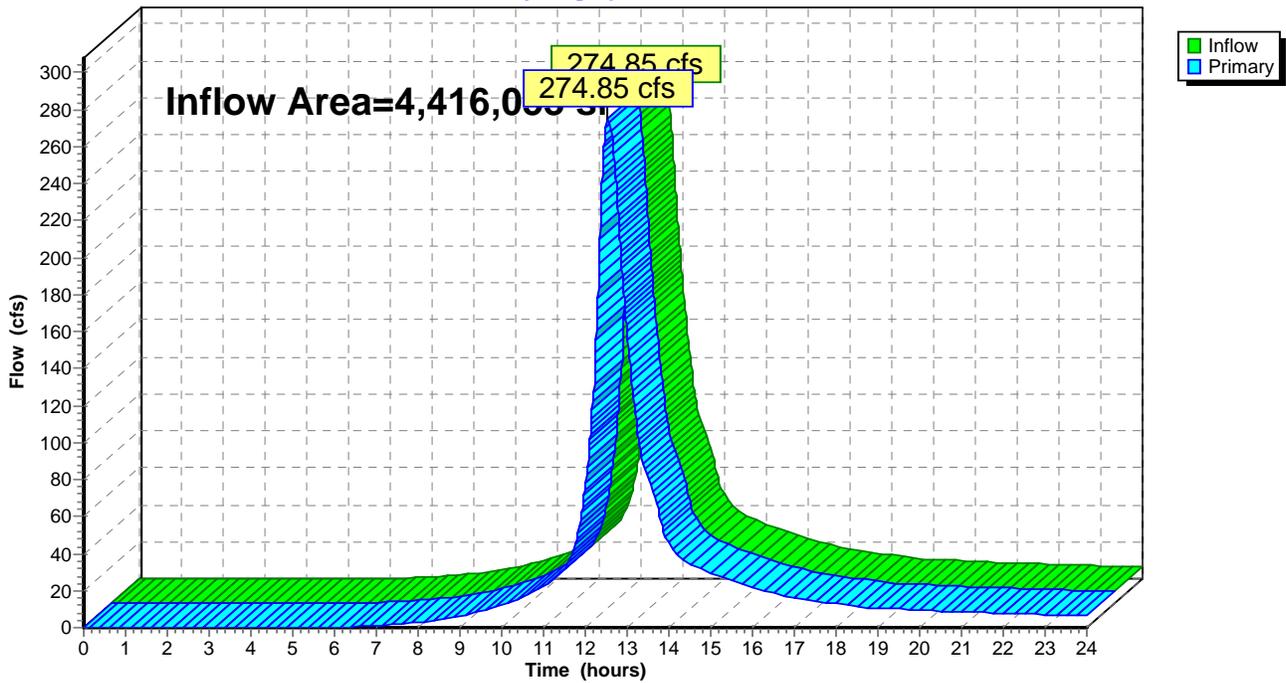
### Summary for Link 171L: Culvert

Inflow Area = 4,416,053 sf, 0.90% Impervious, Inflow Depth > 4.89" for 100-Year event  
Inflow = 274.85 cfs @ 12.55 hrs, Volume= 1,800,313 cf  
Primary = 274.85 cfs @ 12.55 hrs, Volume= 1,800,313 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link 171L: Culvert

Hydrograph

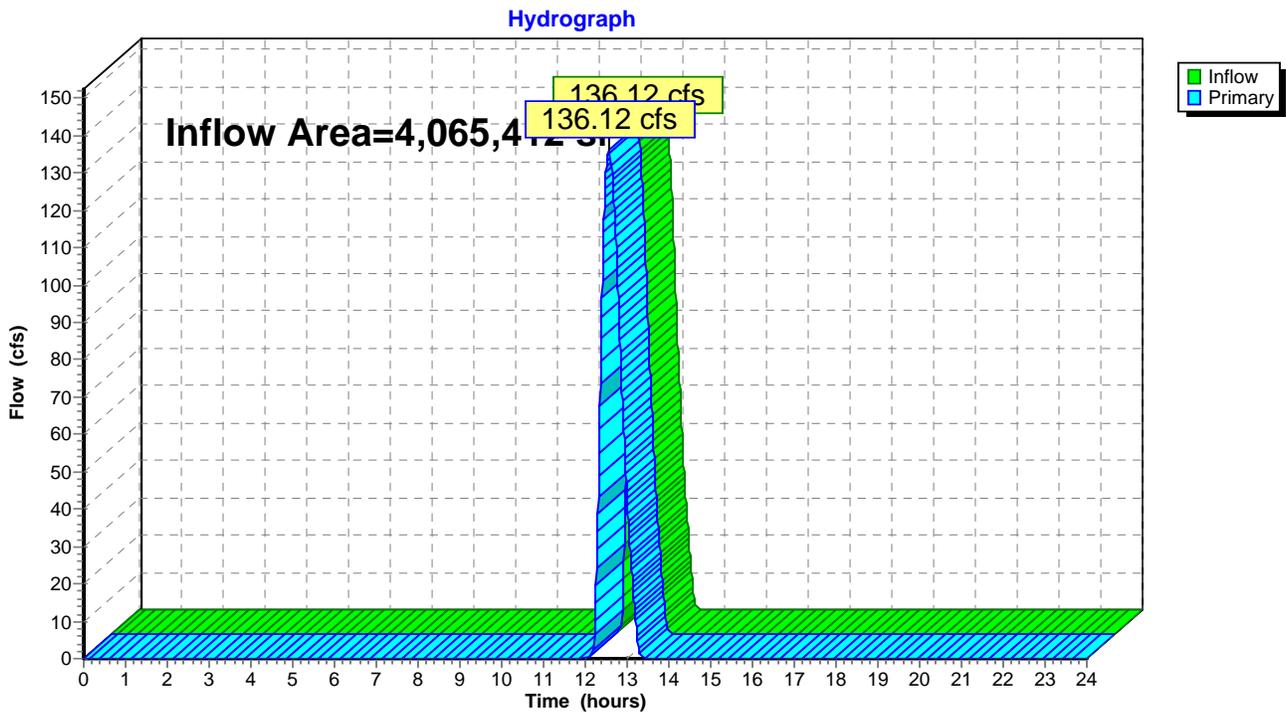


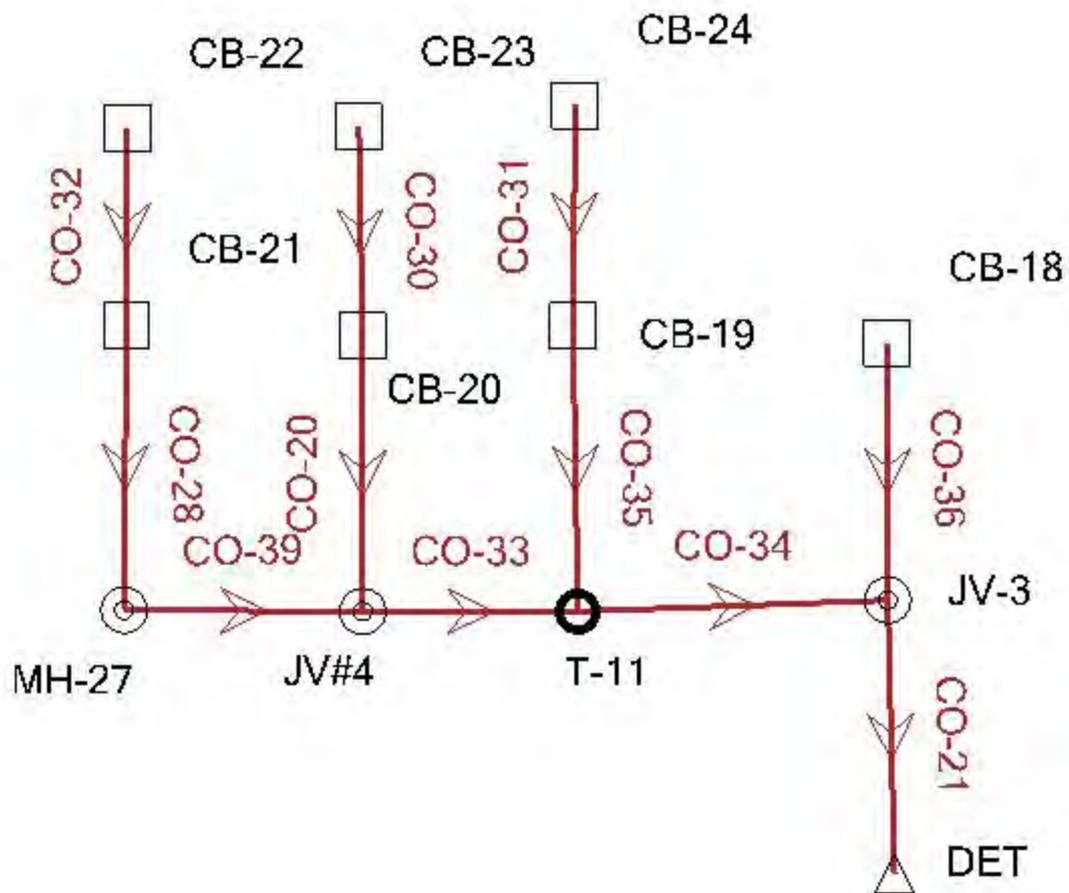
### Summary for Link 173L: Existing Overland Flow Onto Site

Inflow Area = 4,065,412 sf, 0.00% Impervious, Inflow Depth = 0.81" for 100-Year event  
Inflow = 136.12 cfs @ 12.57 hrs, Volume= 274,739 cf  
Primary = 136.12 cfs @ 12.57 hrs, Volume= 274,739 cf, Atten= 0%, Lag= 0.0 min

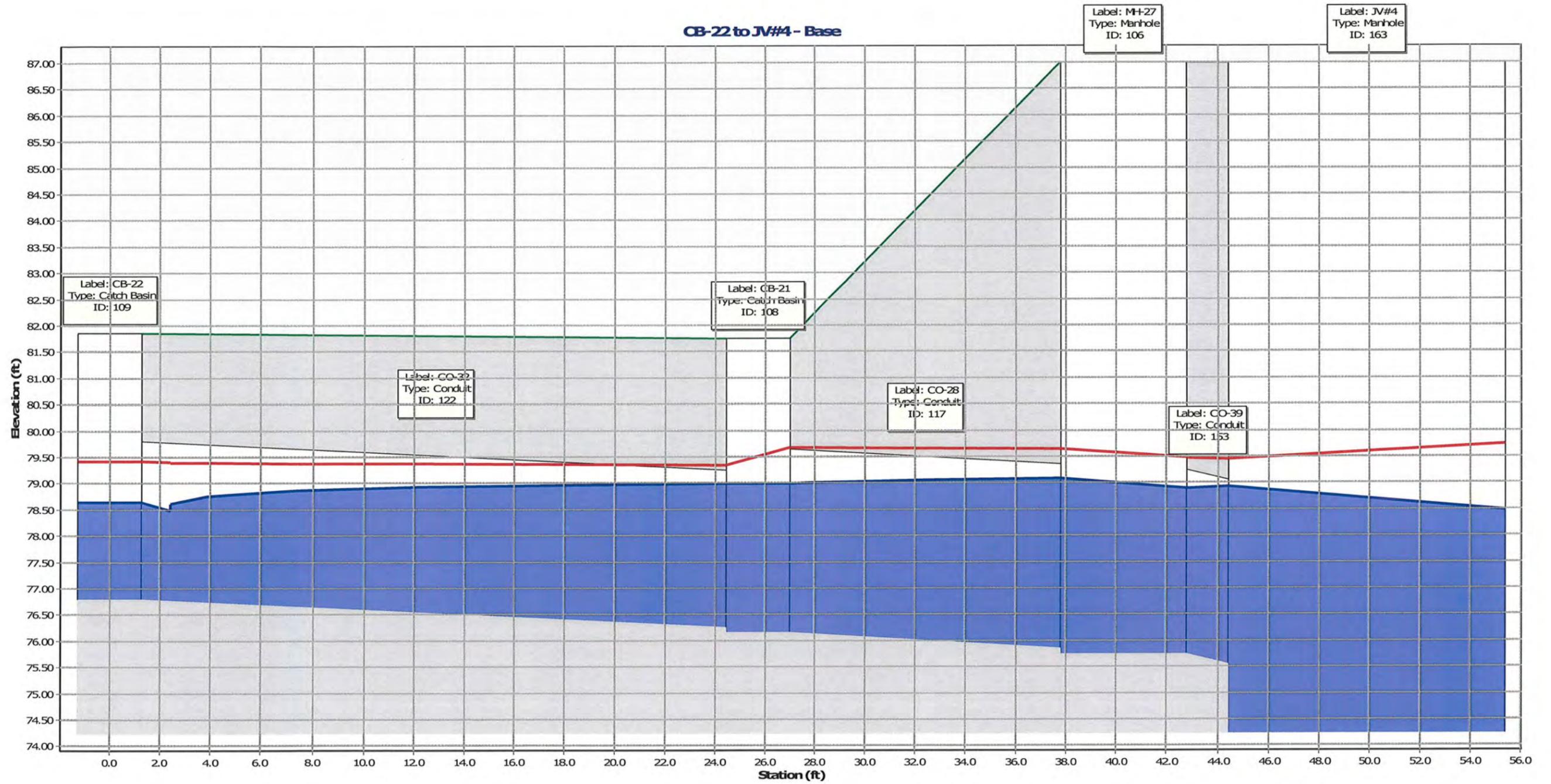
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link 173L: Existing Overland Flow Onto Site

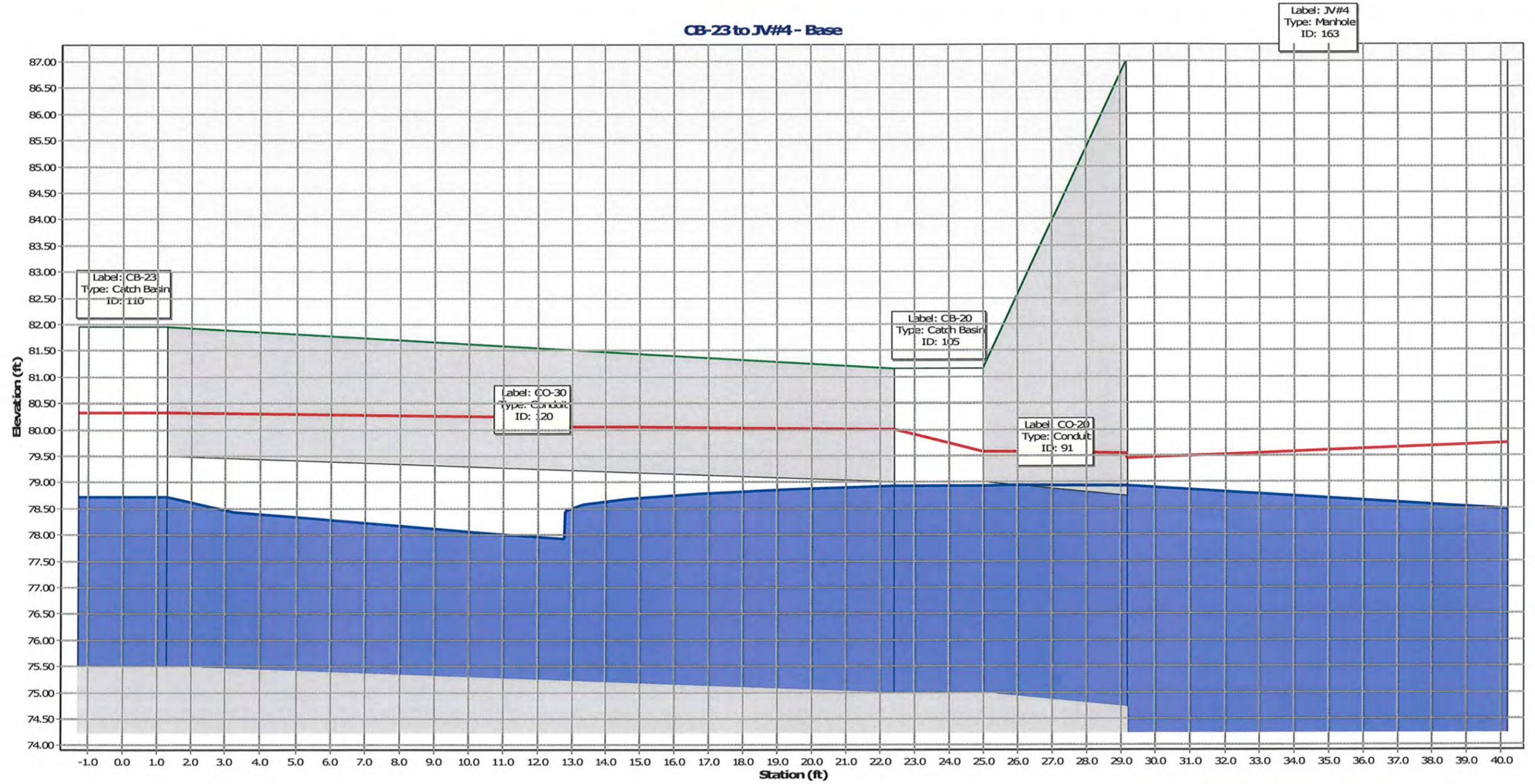




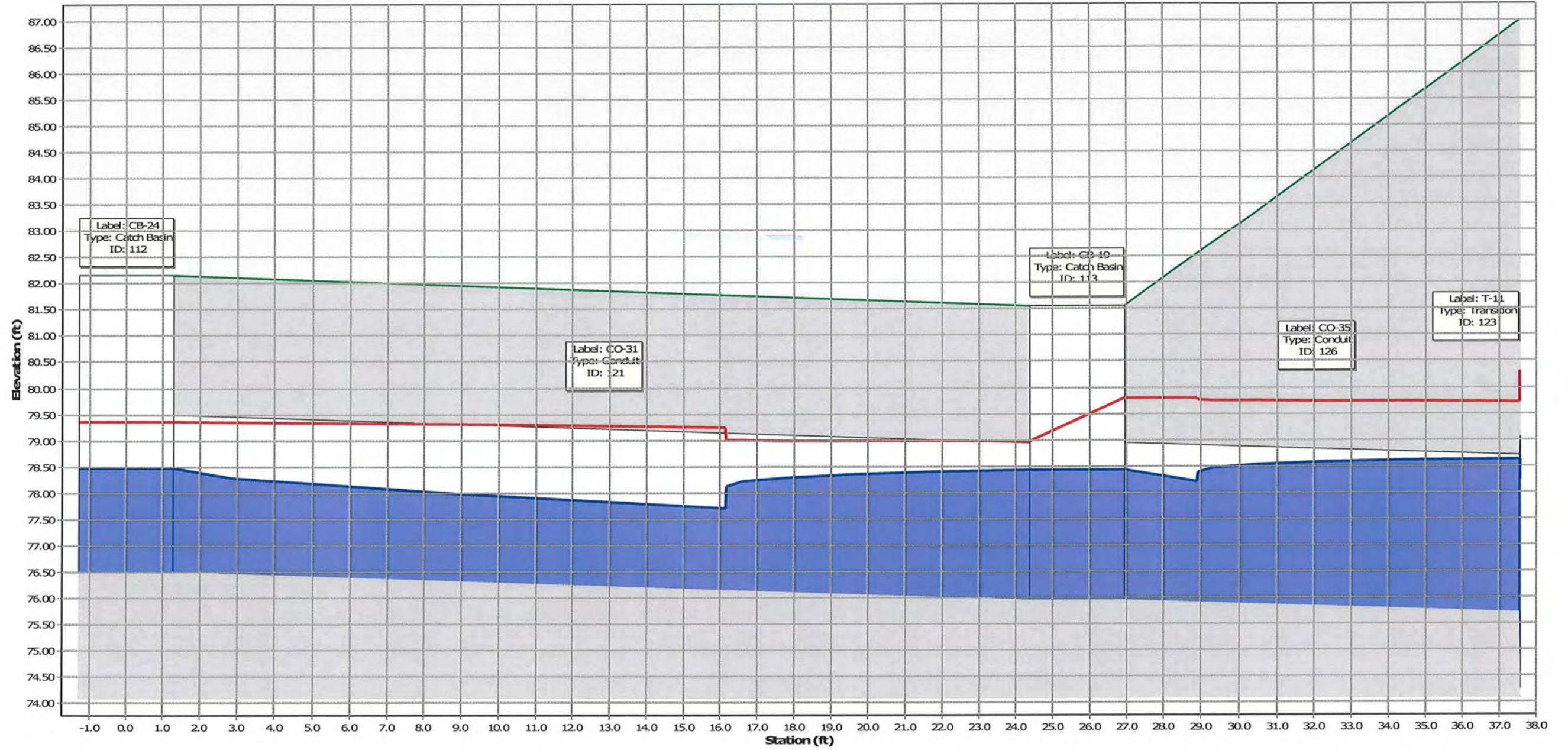
CB-22 to JV#4 - Base



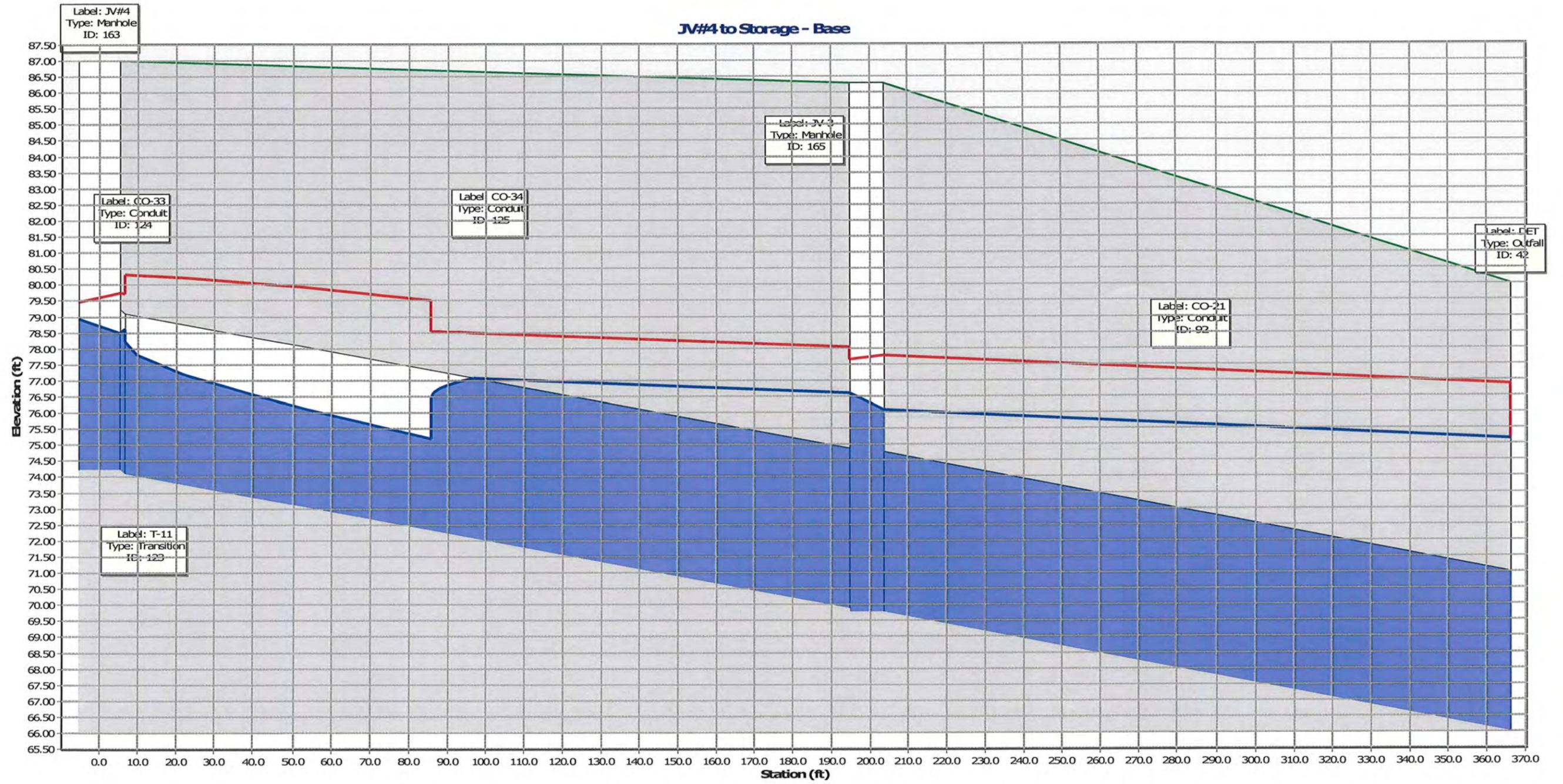
CB-23 to JV#4 - Base



CB-24 to Culvert - Base



JV#4 to Storage - Base



**FlexTable: Conduit Table**

ID	Label	Start Node	Set Invert to Start?	Invert (Start) (ft)	Stop Node	Set Invert to Stop?	Invert (Stop) (ft)	Has User Defined Length?	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)
91	CO-20	CB-20	True	75.00	JV#4	False	74.73	True	11.0	0.025	Box		0.013	152.62
92	CO-21	JV-3	True	69.77	DET	True	66.00	True	167.0	0.023	Box		0.013	314.36
117	CO-28	CB-21	True	76.15	MH-27	False	75.85	True	14.6	0.021	Circle	42.0	0.011	55.60
120	CO-30	CB-23	True	75.50	CB-20	False	75.00	True	23.7	0.021	Box		0.013	131.26
121	CO-31	CB-24	True	76.50	CB-19	False	75.95	True	25.7	0.021	Circle	36.0	0.011	37.25
122	CO-32	CB-22	True	76.80	CB-21	False	76.25	True	25.7	0.021	Circle	36.0	0.011	32.15
124	CO-33	JV#4	True	74.23	T-11	False	74.08	True	6.7	0.023	Box		0.013	229.71
125	CO-34	T-11	True	74.08	JV-3	False	69.87	True	192.7	0.022	Box		0.013	288.50
126	CO-35	CB-19	True	75.95	T-11	False	75.70	True	11.9	0.021	Circle	36.0	0.011	58.79
129	CO-36	CB-18	True	75.00	JV-3	False	71.00	True	14.9	0.269	Circle	24.0	0.011	25.86
153	CO-39	MH-27	True	75.75	JV#4	False	75.55	True	9.6	0.021	Circle	42.0	0.011	55.60

Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Froude Number (Normal)
17.61	4.20	485.33	31.4	36.1	2.583
10.48	9.16	633.56	49.6	49.7	2.357
15.84	3.24	170.43	32.6	39.3	2.757
16.56	3.93	265.63	49.4	49.6	2.073
14.56	2.48	115.37	32.3	39.1	2.745
13.98	2.74	115.31	27.9	36.1	2.758
19.30	4.54	632.82	36.3	39.7	2.416
20.35	6.72	623.35	46.3	47.3	2.334
16.28	2.92	114.25	51.5	50.8	2.616
33.79	5.59	138.70	18.6	29.2	9.187
15.92	3.38	171.61	32.4	39.2	2.776

**FlexTable: Catch Basin Table**

ID	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Length (ft)	Width (ft)	Inlet Type	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Notes	Flow (Additional Carryover) (cfs)	Flow (Additional Subsurface) (cfs)	Flow (Known) (cfs)	
105	CB-20	81.15	True	81.15	75.00	2.58	6.67	Full Capture	78.93	78.93		1	21.36	0.00	0.00
108	CB-21	81.74	True	81.74	76.15	2.58	6.67	Full Capture	78.99	78.99			21.09	2.36	0.00
109	CB-22	81.86	True	81.86	76.80	2.58	6.67	Full Capture	78.64	78.64			29.25	2.90	0.00
110	CB-23	81.96	True	81.96	75.50	2.58	6.67	Full Capture	78.72	78.72		2	30.57	100.69	0.00
112	CB-24	82.15	True	82.15	76.50	2.58	6.67	Full Capture	78.49	78.49			31.56	5.69	0.00
113	CB-19	81.55	True	81.55	75.95	2.58	6.67	Full Capture	78.43	78.43			21.54	0.00	0.00
128	CB-18	86.00	True	86.00	75.00	2.58	6.67	Full Capture	76.78	76.78		3.68	22.18	0.00	

1. Flows entering CB #19-21 were taken from Pond 177P: West Ave. - 50% Clog to model highest flows.

2. Flows entering CB#22-24 were taken from Pond 178P: West Ave. - No Clog to model highest flows.

**FlexTable: Manhole Table**

ID	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Bolted Cover?	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Headloss Method	Absolute Headloss (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
106	MH-27	87.00	True	87.00	False	75.85	55.60	3.15	78.90	79.09	AASHTO		5.98	6.10
163	JV#4	87.00	True	87.00	False	74.73	229.71	4.26	78.49	78.93	AASHTO		5.84	9.00
165	JV-3	86.30	True	86.30	False	69.87	314.36	6.32	76.09	76.59	AASHTO		8.23	10.48

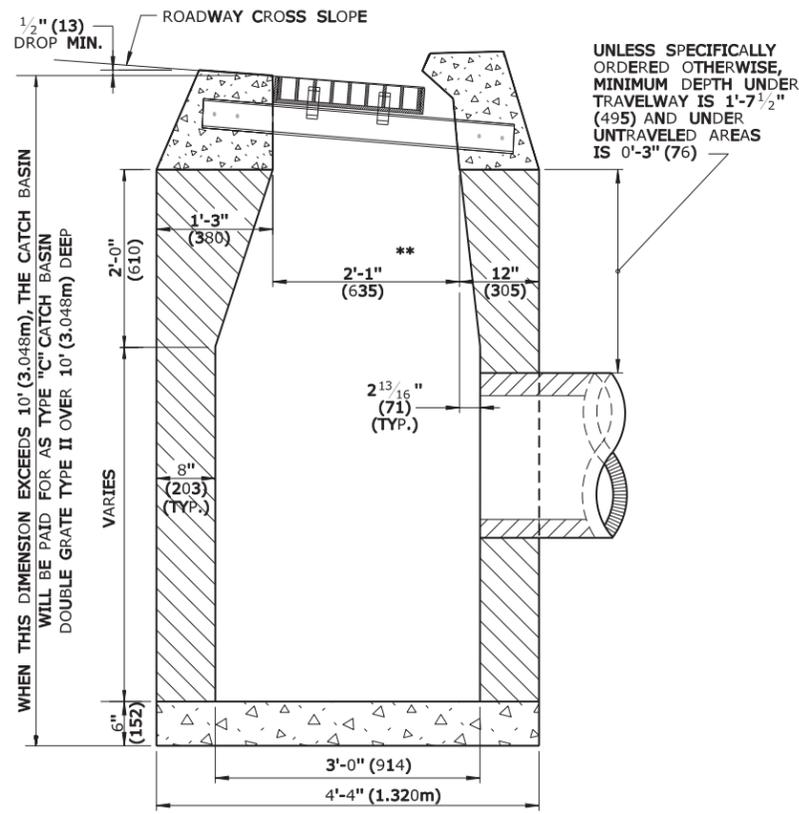
  

HEC-22 Benching Method	Total Structure Energy Losses (ft)	Flow (Known) (cfs)
<None>	(N/A)	0.00
<None>	(N/A)	21.49
<None>	(N/A)	0.00

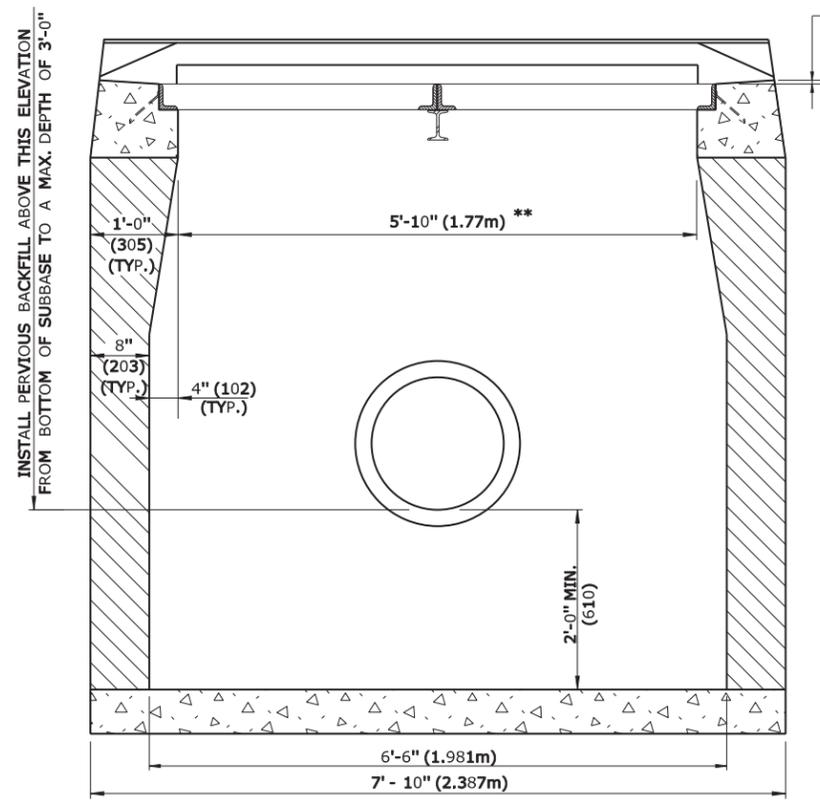
**FlexTable: Transition Table**

ID	Label	Elevation (Ground) (ft)	Elevation (Top) (ft)	Elevation (Invert) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Notes	AASHTO Shaping Method	Bend Loss (AASHTO) (ft)	Bend Loss Coefficient (AASHTO)	Bend Loss Conduit Flow (AASHTO) (cfs)	Bend Loss Controlling Pipe (AASHTO)	
123	T-11	87.00	79.05	74.08	288.50	4.16	78.62	78.24		Full	0.76	0.700	58.79	CO-35	
	Bend Loss Pipe Angle (AASHTO) (degrees)	Bend Loss Pipe Velocity (AASHTO) (ft/s)	Bend Loss Pipe Velocity Head (AASHTO) (ft)	Contraction Loss (AASHTO) (ft)	Contraction Loss Coefficient (AASHTO)	Correction factor for shaping (AASHTO)	Expansion Loss (AASHTO) (ft)	Expansion Loss Coefficient (AASHTO)	Expansion Loss Controlling Pipe (AASHTO)	Expansion Loss Pipe Flow (AASHTO) (cfs)	Expansion Loss Pipe Velocity (AASHTO) (ft/s)	Expansion Loss Pipe Velocity Head (AASHTO) (ft)	Is Non-Piped Flow Significant? (AASHTO)	Non-Piped Flow Correction Factor (AASHTO)	Unadjusted Headloss (AASHTO) (ft)
	90.00	8.38	1.09	0.00	0.001	0.500	0.00	0.001	CO-33	229.71	8.43	1.10	False	1.000	0.77



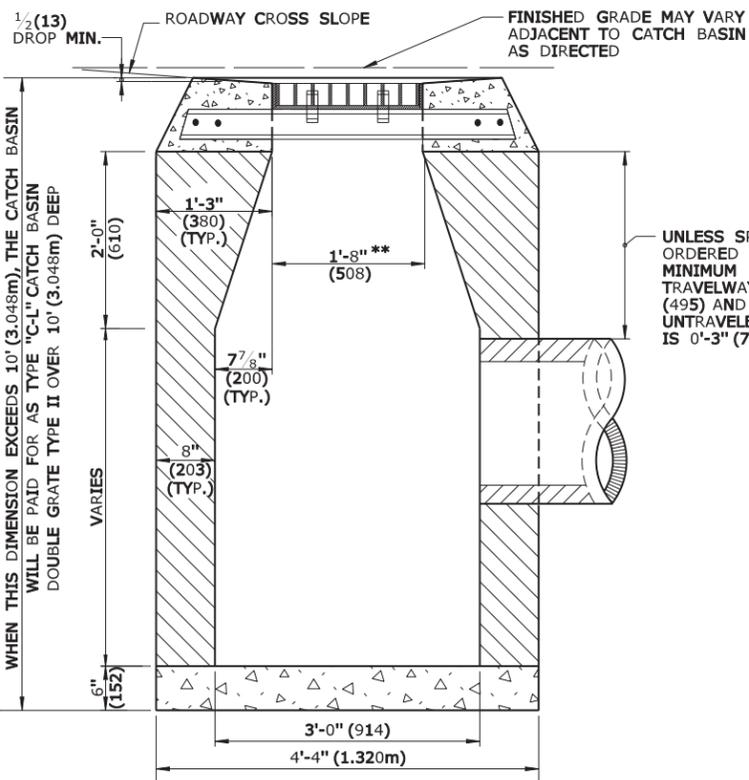


**SECTION B**

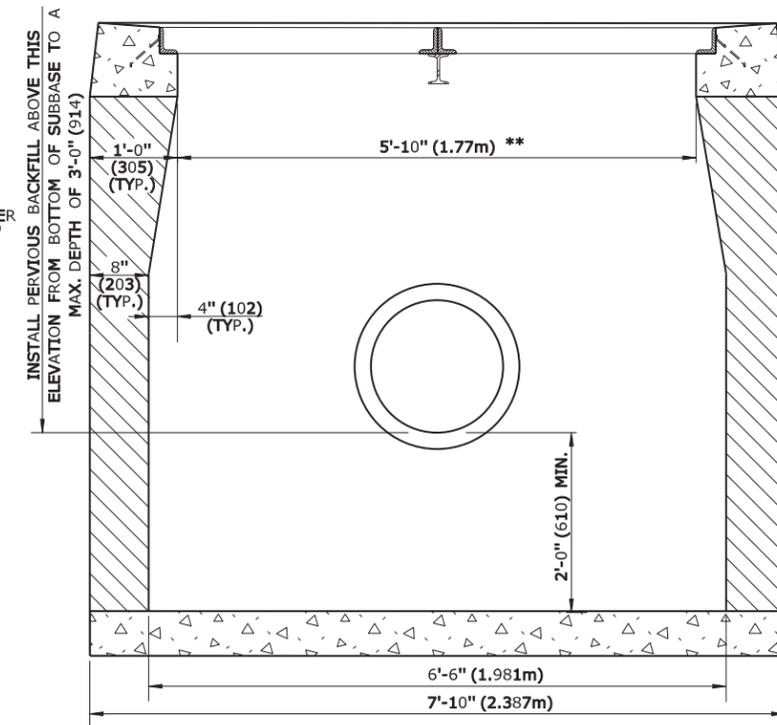


**SECTION A**

**TYPE "C" CATCH BASIN DOUBLE GRATE - TYPE II**



**SECTION B**

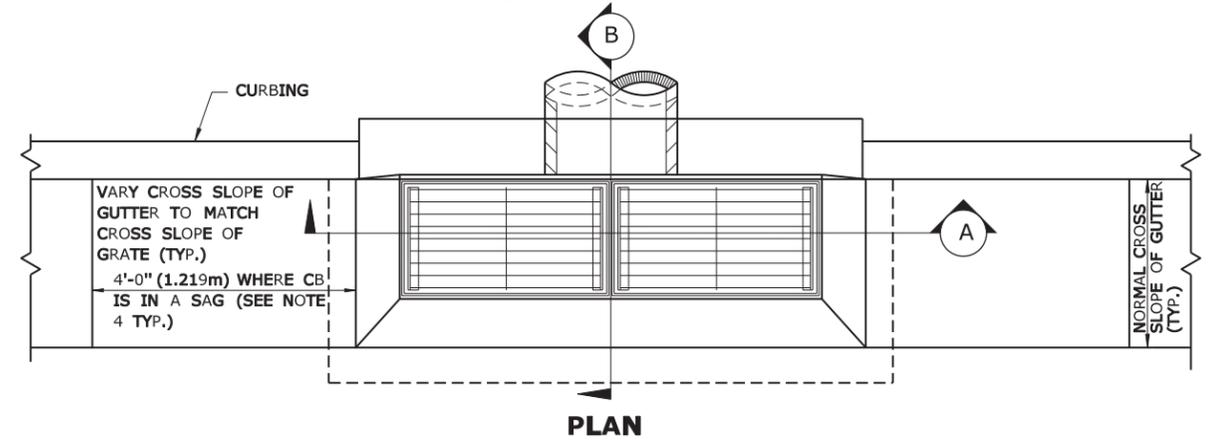


**SECTION A**

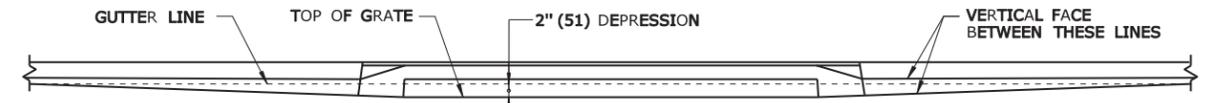
**TYPE "C-L" CATCH BASIN DOUBLE GRATE - TYPE II**

**GENERAL NOTES:**

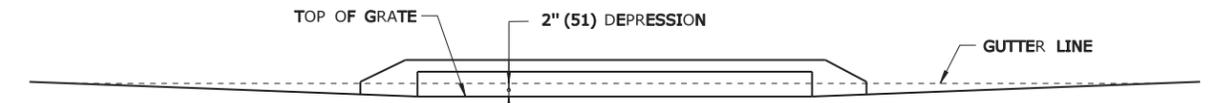
1. FOR DETAILS OF FRAME AND GRATE SEE STANDARD SHEET HW-507-08.
2. USE APPROPRIATE CONCRETE TOP FOR CURBING SHOWN ON PLANS. IF CURBING IS NOT SPECIFIED ON THE PLANS, IT SHALL BE CONSTRUCTED AS DIRECTED BY THE ENGINEER.
3. ALL FACES OF STRUCTURES IN CONTACT WITH CONCRETE PAVEMENT SHALL BE COVERED WITH A LAYER OF TAR PAPER OR APPROVED EQUAL. THE COST FOR THE PAPER SHALL BE INCLUDED IN THE BID PRICE FOR THE TYPE OF CATCH BASIN INSTALLED.
4. USE 6'-0" (1.830m) ON UPGRADE SIDE OF CONTINUOUS GRADE AND 1'-0" (305) ON DOWNGRADE SIDE OF CONTINUOUS GRADE OR AS DIRECTED.
5. IF MASONRY UNITS ARE REQUIRED, THE BASIN SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE OVER ALL DIMENSIONS SHOWN HERE AND SECTION 5.07 OF THE STATE OF CONNECTICUT'S STANDARD SPECIFICATIONS. CORBELLING SHALL BE PERMITTED TO A MAXIMUM OF 3" (75). NO PROJECTION SHALL EXTEND INSIDE THE LIMITS NOTED BY \*\*.
6. WALL THICKNESS OF ALL CB'S OVER 10' (3.048m) DEEP SHALL BE INCREASED TO 12" (305) THICK. INSIDE DIMENSION SHALL REMAIN THE SAME. (12" (305) THICKNESS WILL START AFTER THE FIRST 10' (3.048m)).
7. TO CONVEY SUBSURFACE DRAINAGE, OPENINGS SHALL BE FORMED IN THE FOUR WALLS AT OR IMMEDIATELY ABOVE THE BOTTOM OF THE PERVIOUS BACKFILL.
8. MINIMUM CONCRETE COMPRESSIVE STRENGTH OF F'c = 4000 PSI (27,580 kPa) SHALL BE OBTAINED PRIOR TO SHIPPING.
9. LATEST STATE OF CONNECTICUT'S STANDARD SPECIFICATIONS AND SUPPLEMENTALS SHALL GOVERN.



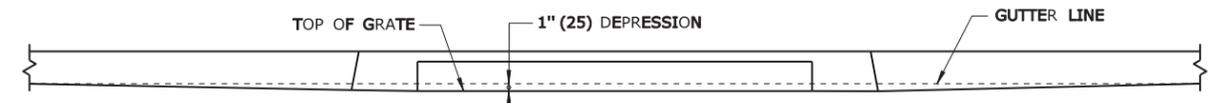
**PLAN**



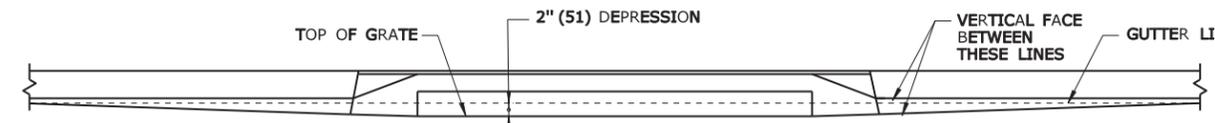
**FOR CATCH BASINS IN A LINE OF 4" (102) CONCRETE PARK CURBING OR 4" (102) BITUMINOUS CONCRETE PARK CURBING**



**FOR CATCH BASINS WHERE NO CURBING OF ANY TYPE EXISTS OR IS PROPOSED**



**FOR CATCH BASINS IN A LINE OF 6" (152) CONCRETE CURBING OR 6" (152) STONE CURBING**



**FOR CATCH BASINS IN A LINE OF 6" (152) BITUMINOUS CONCRETE LIP CURBING (MACHINE FORMED)**

**DETAILS OF DEPRESSED GUTTER STRIP FOR TYPE "C" CATCH BASIN DOUBLE GRATE TYPE II**

ALL METRIC DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED

REV.	DATE	REVISION DESCRIPTION

NOT TO SCALE

STATE OF CONNECTICUT  
DEPARTMENT OF TRANSPORTATION

SUBMITTED BY: NAME/DATE/TIME:  
APPROVED BY: NAME/DATE/TIME:

CTDOT  
STANDARD SHEET  
OFFICE OF ENGINEERING

TYPE "C" , "C-L" &  
DOUBLE GRATE TYPE - II

STANDARD SHEET NO.:  
HW-507\_03